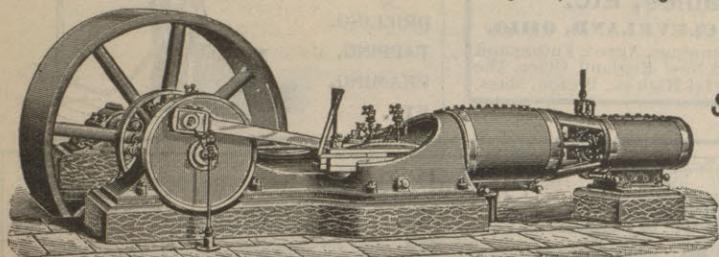


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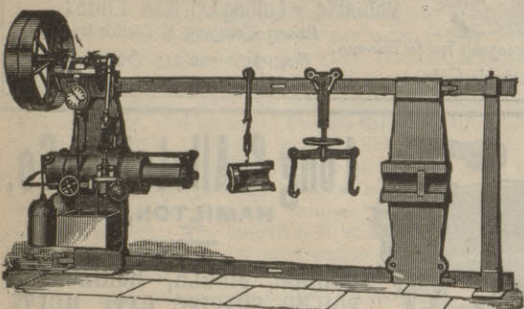


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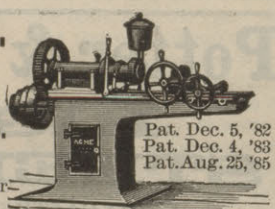


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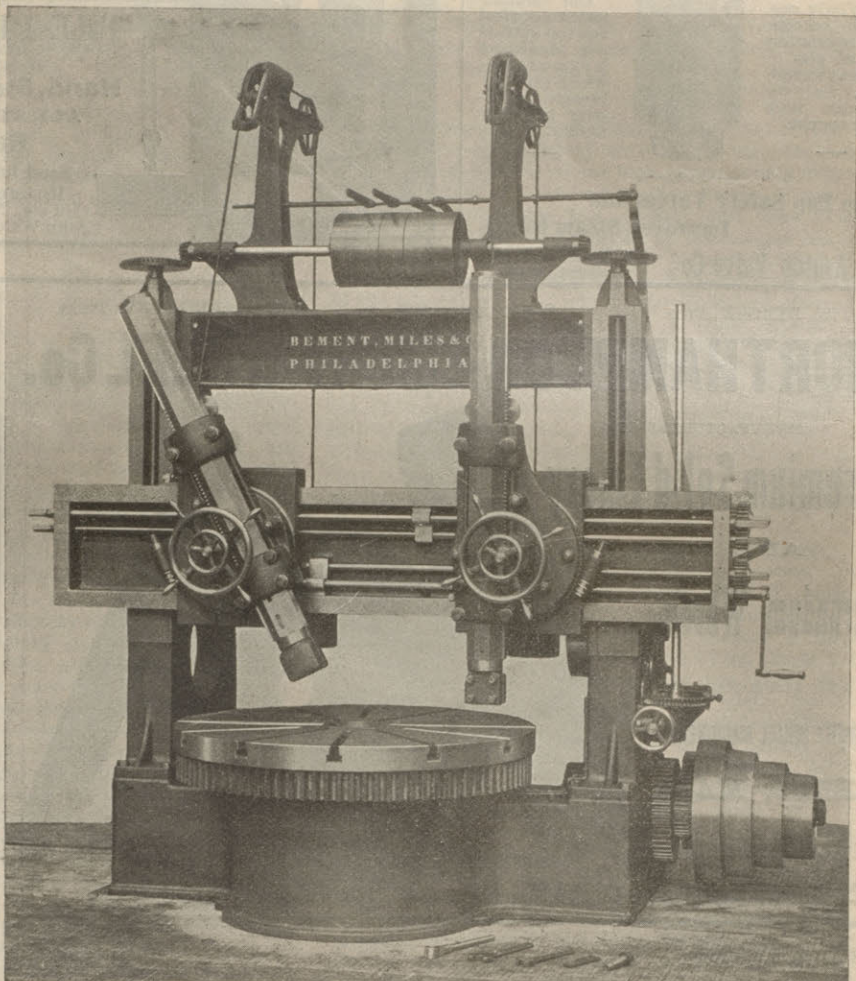
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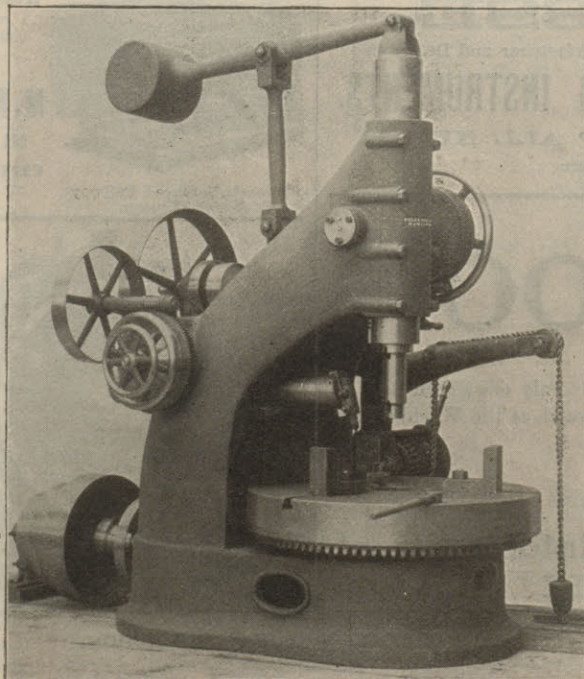
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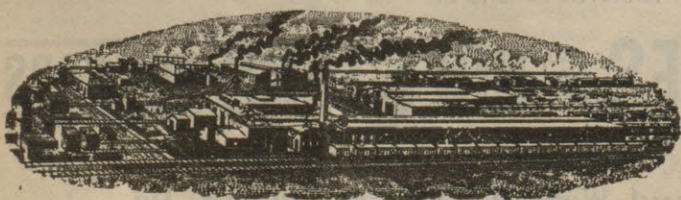
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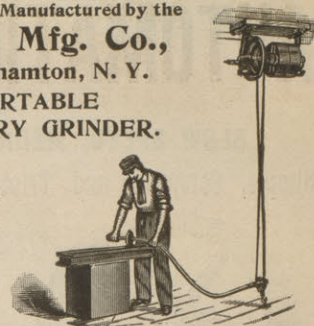
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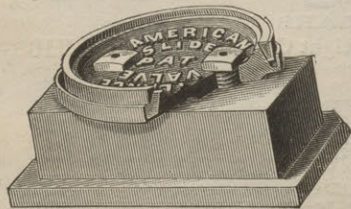
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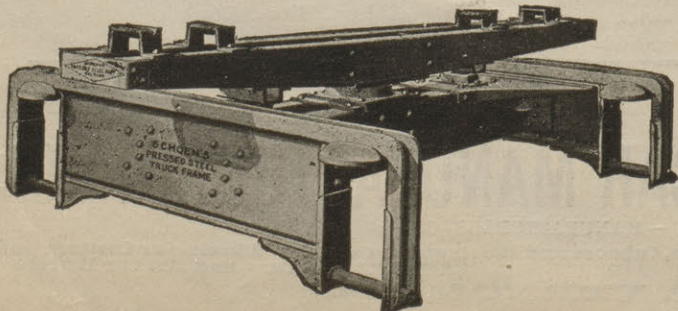
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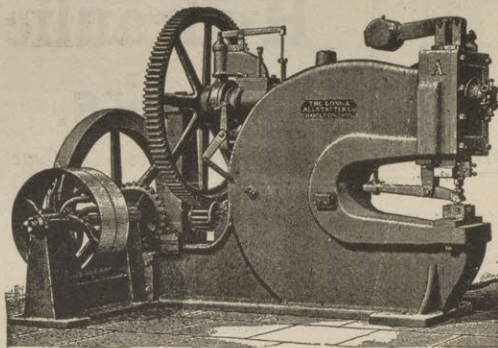
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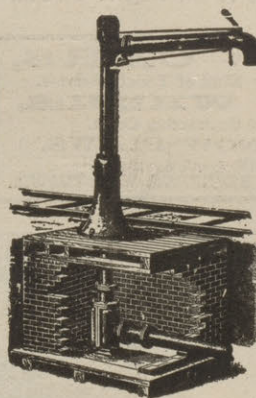
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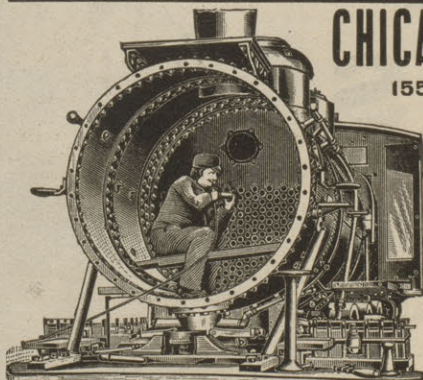
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No. 13.

Paternalism is applied by the governments of Australia to pretty nearly everything which has a community interest. Writers for the press having only encyclopædic information to guide them, are often found expressing surprise that such young countries, without standing armies, or civil strife, or foreign wars, should have piled up such comparatively enormous debts. Whilst the per capita indebtedness is undoubtedly large—too large, perhaps—it should be remembered that the governments there stand for the indebtedness that is in this country borne by railroad, telegraph, telephone, water supply and other corporations. Our railroads alone are computed to have an indebtedness of \$6,000,000,000. Of course it makes all the difference that the public debts of Australia were contracted for what are there called "reproductive works"

Those works, except in the case of several railroads, earn fair interest and are fully worth what they cost.

This reference to railroads brings us to a larger, more important and graver phase of paternalism, as it is practiced in Australia, than any thing so far touched upon. The railroads are there built, owned and operated by the government. It is to the supposed success believed to be there attendant upon the management of the railroads "by, through and for the people," that advocates of government control in this country base their chief arguments. In so far as they may justly claim that the system has worked successfully under that popular form of government, they may be right in believing that it may do equally well under ours. As the matter is now, one of both local and national importance, it is of interest to inquire just how that is. The conditions are not exactly parallel, because they have in Australia a permanent and most rigid civil service system, for which this country is most certainly not prepared. Severe examination as a starter, permanence of tenure as a continuance, and a retiring pension as a finale are conditions which prevail there, but which our spoilsmen and frequent changes of administration would oppose our adopting in these United States.

Of the various states or colonies, of the Australian group, Victoria, of which the city of Melbourne is the capital, is credited with being the first in point of importance. It has the largest population, the most fertile lands, the ablest public men, and exhibits the most public spirit. In constructive legislation it has shown much originality, ingenuity and character. Its very excellent ballot law is favorably known to us all. Its land transfer act has been adopted in Illinois, and might with advantage be applied to the conditions existing in California. It is in Victoria that paternalism has had its most thorough trial. As we have seen, it has there had its successes, but, as will presently appear, when it came to the matter of railroad ownership and management, it utterly and hopelessly broke down and involved the country in financial embarrassment and almost ruin. When control of the railroads was first undertaken by the government, their management was placed in the hands of a minister of railways, who was a cabinet officer and a member of parliament. It was soon discovered, however, that a political head could not wisely, economically, or even safely, manage any such department. Fare and freight charges were fixed, cheap excursion trains run, and new lines built in the interests of political support. It was determined to effect a radical change and to make the management as near as possible a one man power. A permanent board of directors, consisting of three members, removable only by a vote of both houses of parliament, was created and given charge of the whole subject matter. The chairman of that board was to be an experienced railroad manager, who alone was to be held responsible for the workings of the department. His two colleagues were to act merely in an advisory capacity. The greatest care was taken to obtain the right man to fill the chief place. The large salary of \$25,000 per annum that was offered proved sufficient to secure the services of one of the best known railroad men in England. Within seven years this able man (Mr. Speight), against whose personal integrity not one word has ever been uttered, had bankrupted the government and well nigh ruined the country. Government ownership and the ultimate possibility of parliamentary intervention proved insurmountable barriers to success. It was found impossible to eschew politics, or render economical methods paramount.

Electric Welding with an Ordinary Lighting Current.

A short time ago experiments were carried out at the Deptford Works of the London (England) Electric Supply Corporation by the Electric Welding Company to ascertain if an ordinary lighting current could be used for electric welding. Hitherto this process has been carried out by a specially generated current. But the advantage of being able to use the ordinary current is obvious—it would especially suit the generating companies which have little work to do in the day time. The Engineer describes the apparatus as follows: It consists 1, of a generator of alternating current; 2, a welding transformer provided with clamps and mechanical appliances to work the heated metal; and 3, an electrical regulating apparatus which is used to control the heat in the metal to be welded, this regulation being effected by varying the intensity of the generator fired.

The transformer consists of a cylindrical core made of stampings of charcoal iron. On this core is wound the primary of the transformer. The secondary consists of one turn of massive copper wire. In the 40 kilowatt type this secondary has an area of about 27 square inches. The ends of the secondary are brought close together, but are insulated one from the other by an insulating disc. The movable clamps into which the article to be welded is fixed slide on these two ends of the secondary. The maximum working electromotive force of the primary is 300 volts, and the ratio of turns of primary to secondary is about 300 to 1, consequently the electromotive force is very low. The usual method of working larger transformers is to have a separately excited generator, in the field circuit of which an adjustable rheostat is fixed. This rheostat is controlled by the smith at the welder, and as the sole technical knowledge necessary for increasing or decreasing the heat is confined to the turning of a handle to the right or left, it will be seen that a smith without previous electrical knowledge can, with a few days' practice, completely master the working of this method of welding.

A 40 kilowatt welder, such as was used in these experiments, occupies a floor space of 55 x 34 in., and weighs 2,800 lbs. The welding capacity—cross sections—in square inches, is: iron and steel, 3.1; brass, 1.8; copper, 0.79. The demand for rubber tires for all classes of carriages has brought into use tires of difficult section. For welding in the ordinary manner such sections, however, are admirably adapted for electric welding on the Thomson process.

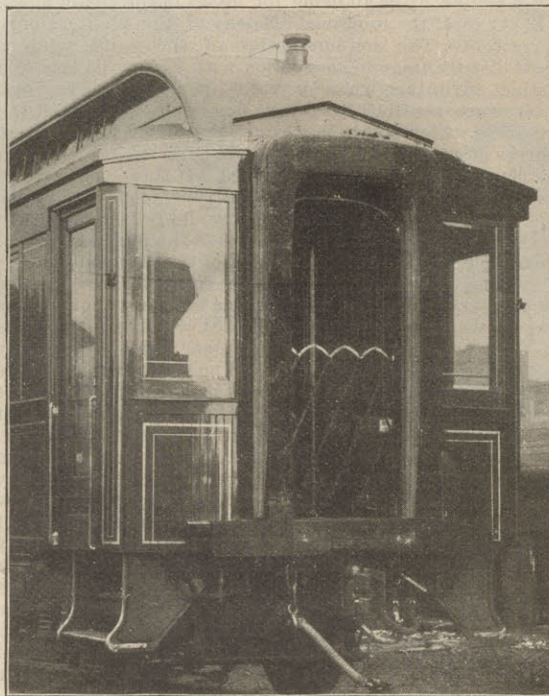
During the last few months the Electric Welding Company has welded commercially at its works a large quantity of tires of widely varying shapes and difficult sections. They have also been able to weld electrically

parts on to gun actions having on them valuable work which would otherwise be thrown away.

Another interesting piece of work which has been done recently was the welding of a new piece of armature shafting on to an armature which was already wound. This was done without damaging the windings by heat. The experiment made at Deptford was with a view to finding out if current could be taken from the supply station mains and used for welding purposes. It was found that welding in this way could be successfully carried out. The experiments were successful, the 5,000 volt alternating current supplied by the Ferranti dynamos being let down to 300 volts by a transformer, and supplied at that tension to the welder, when it was again let down to something less than 1 volt. A high power is required on large sections, but only for a very short time.

WIDE VESTIBULE FOR PASSENGER COACHES.

The accompanying illustration, for which are indebted to Mr. A. M. Waitt, general master car builder of the Lake Shore & Michigan Southern Railway, shows the first application, so far as is known, which has been made of wide vestibules to passenger coaches. This arrangement was designed and constructed by Mr. Waitt in accordance with the general details of the Wagner vestibule, and there is nothing specially new in this except the application



WIDE VESTIBULES APPLIED TO COACHES.

of the vestibule to this type of car. The steps are covered when not in use by trap doors, and the enclosed space extends across the full width of the car. A gas lamp is placed in the dome and the finish of the doors and sash are likewise in accordance with the practice in sleeping car construction.

The cars are finished in mahogany and are strongly built with composite side and end sills. The seats are high backed, of the Hale & Kilburn pattern. The painting of two of the cars, which are to be used over the Big Four road, is in accordance with the Wagner standard, and panels are replaced by the fine beaded sheathing such as is used upon the Wagners. There are also ten similar cars to be built for use upon the Lake Shore line entirely, which are similar to the one shown, except that the standard Lake Shore color is to be retained as well as the wide panels.

ADVANTAGES OF RAISING THE CENTER OF GRAVITY OF LOCOMOTIVES.

In the February number of the bulletin of the National Railway Congress a translation is given of an article which appeared recently in the *Genie Civil* upon the subject of the advantages of raising the boiler and center of gravity of locomotives with a view of obtaining an increase in power and decrease in strain on the permanent way. This article is given in substance in the following which is of course from a French point of view.

There has been a tendency toward keeping the center of gravity low which has undoubtedly helped to retard the development of the locomotive, and it was only since what may to-day be called a prejudice, was renounced, that by making the boiler to a certain extent independent of the other parts that express engines have been placed in this respect on the same footing as those with wheels of small diameter, and this has markedly increased the power of the engines. In England they were already building what appeared to us very high engines, when the Americans who had until then remained faithful to the classical patterns, decided under the spur of necessity to raise the boilers of their engines above the wheels and subsequently went much further in this direction than any European builder had dared to go. The highest of these engines used upon the New York Central hauling the Empire State Express demonstrated in handling one of the fastest trains in the world that the utmost limit of stability had

not been reached, and the raising of the center of gravity was shown to be safe and good practice. In the Crampton engine the axis of the barrel was 5 ft. 3 in. above the top of the rails. In the Orleans company's outside cylinder express locomotive, it was 6 ft. 5 in., while in the Northern Railway's outrance type it was 6 ft. 11 in. Later on this height was increased on some of the French lines, and in most express engines recently built, the axis of the boiler is between 7 ft. 2½ in. and 7 ft. 5½ in. All express engines constructed during the last twelve years in England have the axis of their boilers at a minimum height of 7 ft. 5 in.; if the engines have internal cylinders and single driving wheels, the height usually stands between 7 ft. 7½ in., and 7 ft. 10½ in. and ex-

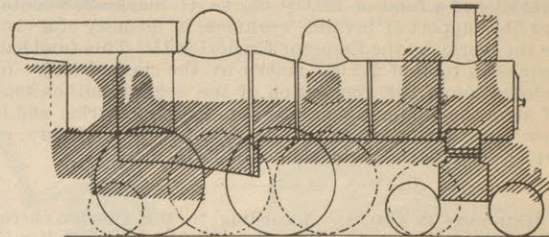


FIG. 1.—FRENCH AND AMERICAN PRACTICE.

ceptionally even 7 ft. 10½ in., as in the Northeastern express engines. In Belgium they have reached 7 ft. 9½ in., and in Austria 8 ft. ¼ in., while the maximum height of the United States is 8 ft. 11½ in. The height now-a-days regarded as a minimum in the United States is actually greater than the maximum in Europe.

Fig. 1 shows in diagram on the same scale a standard French type of express engine compared with one on an American road which gives a better idea than mere dimensions of how far the Americans have gone beyond us in the power and height of their engines. Also Fig. 2 shows front views of three classical types of engines; an old Crampton, an express engine from the Midland of England, and one of the New York Central engines. The English engine is no doubt very high, but the driving wheels are of great diameter, 7 ft. 8 in., and the diameter of the barrel of the boiler is smaller than the distance between the tires. The New York Central engine is much higher and the boiler reaches beyond the top of the driving wheels the diameter of which is 7 ft. 1 in. To allow this engine to run on our lines we should have to cut off part of the chimney, and the upper part of the dome which is 12 ft. 3½ above the rail.

In his work on the locomotive published in 1877, Mr. Reynolds stated that "of all express engines running at present the highest provide the greatest security." This assertion is in conformity with facts. When the flanges of the wheels of the locomotive strike the rail on a curve, everything else being equal, a jar is given which is all the more violent in proportion as the center of gravity is lower. If we suppose the center of gravity to be at a level with the rail, the strain due to the centrifugal force will be entirely transmitted to the rail; if the center of gravity were removed to an infinite distance above the permanent way, the engine would no longer have any stability, and under the influence of an infinitely slight centrifugal force would balance itself on the

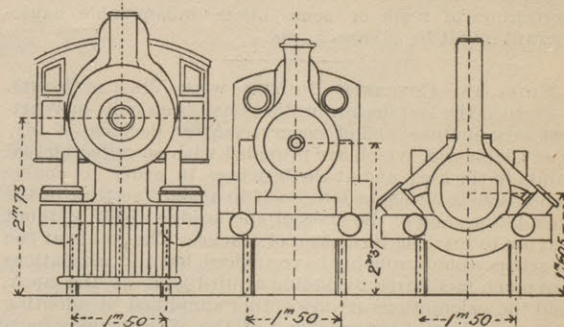


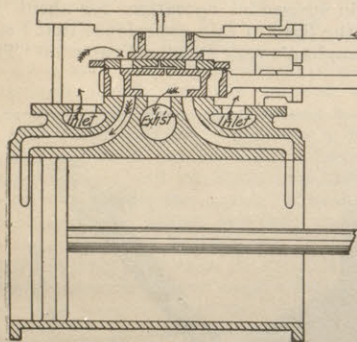
FIG. 2.—THREE WELL KNOWN TYPES.

outer rail without causing any appreciable strain tending towards displacement. In practice, every engine occupies an intermediate position between these extremes, and we can draw the conclusion that the higher an engine is the less will it tend to displace the permanent way. To make it absolutely safe we shall only have to give it the minimum stability consistent with its running no risk of being upset when passing at full speed over curves of the smallest radius which it will have to pass, and experience shows that this limit is not exceeded by the most lofty American engines. If the engine is high, it will roll more, and its springs will come into play without the action being so severe upon the permanent way. An engine may in some ways, be compared to a ship; we know that the greater the stability of a boat and the smaller the range of its roll, the more frequent, sudden and uncomfortable are its movements. On the other hand, boats of little stability have a very long and smooth motion. Everybody has noticed again how much smoother an omnibus travels on a road if it has heavy trucks loaded on the top. This idea, however, should not be carried too far on account of the danger of taking the load off the inner wheels at the curves.

Raising the center of gravity seems to offer nothing but advantage, and it seems necessary to do this if

we desire to increase the power of express engines. But we must now show that in raising a boiler, the general center of gravity of the engine is raised to a much smaller degree. The weight of the boiler with its water does not on the average exceed a quarter of the total weight, and the other three-fourths of the weight has a very low center of gravity. Let us consider a four-coupled bogie express engine weighing 48 tons in working order, with a deep fire-box and boiler about four feet diameter, and the diameter of the wheels 6 ft. 6 in. The parts which carry the weight and make up the mechanism, weigh 36 tons, the center of gravity of which is 3 ft. 2½ in. above the rail. The center of gravity of the boiler full of water would be 11½ in. below the axis of the barrel. Accordingly if the latter is situated 6 ft. 10½ in. above the rails, the center of gravity of the whole will be only 3 ft. 9 in. above the rails. If the axis of the boiler be 8 ft. ½ in. above the rails, the center of gravity would be for the whole 4 ft. ¼ in. In other words, as might have been foreseen, in raising the boiler 1 ft. 3½ in. we have only raised the center of gravity of the engine a little over ¾ in., that is, about 25 per cent. Moreover in the supposed case, the boiler has been raised throughout, whereas the base of the fire-box remains at the same level, and the center of gravity is not raised as high as is the center of the boiler. From what has been said, it seems that the following conclusions may, without risk, be drawn:

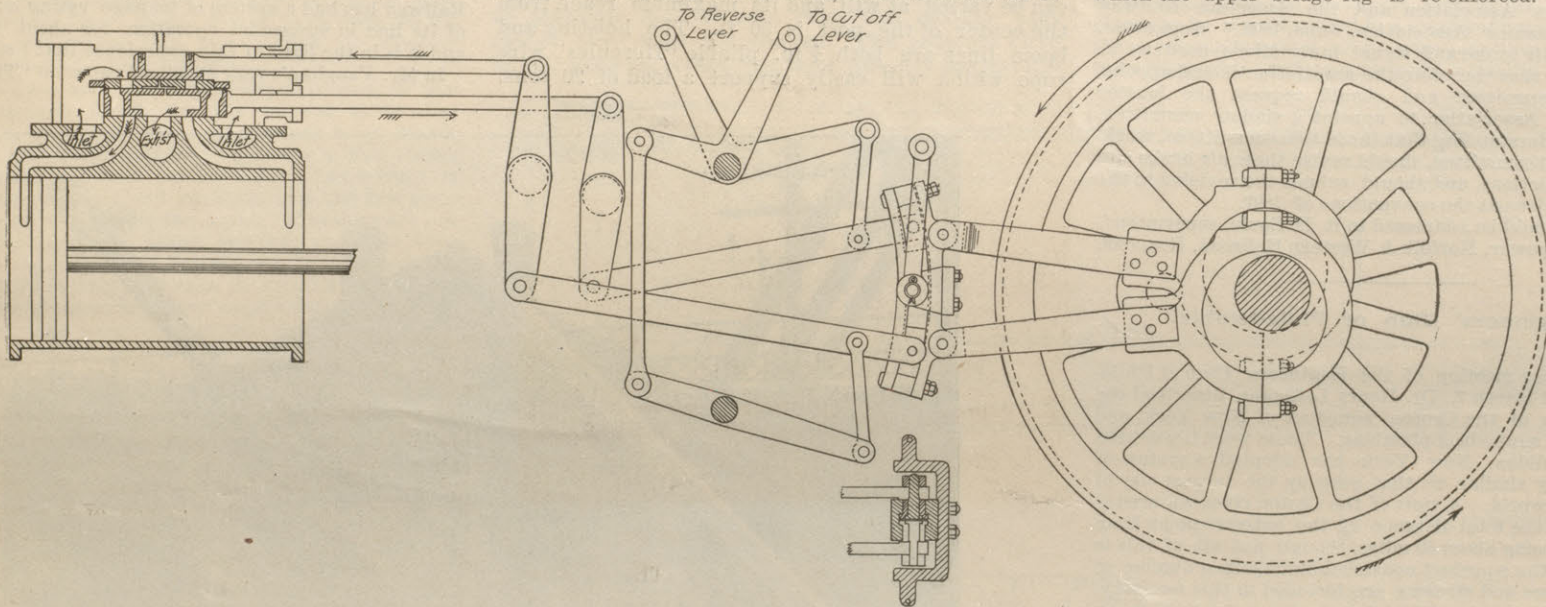
1. Within certain limits which have so far not been reached in Europe or even in America, raising the center of gravity of engines has nothing but good results. It results in decrease in strain on the permanent way and on the parts which go to make up the engine, wheels, axles, boxes and frame plates. The running of the engine is made smoother because



platform in the engine room, in addition to its warmth, is also somewhat contaminated by contact with metal and oily surfaces. The blowers in the forward fire rooms do not properly function at present and are said to be useless. Their supply is through broad louvres under the pilot house. The six room ventilators extending well above deck houses are 20 in. in diameter, and it is through them the fire rooms get their main supply of fresh air. The condenser room blowers ventilate the main engine room. Unless these excessive heat conditions in the fire rooms, contiguous passages, and intricate coal bunkers are remedied, it cannot be expected that the men will long endure continuous labor there. It is physically impossible for the class of men enlisted for this purpose in our navy to undergo the strain of these unfortunate conditions. Though the ship has had as yet no severe or continuous steaming, the firemen constantly apply for relief from symptoms of heat irritation, such as muscular cramps, disordered heart action, nausea, head pains, and weakness."

THE HALEY-HABERKORN VALVE MOTION.

The object for which the valve motion illustrated in the accompanying engraving was designed, is stated by the inventors to consist in reproducing as far as possible upon a locomotive the desirable features of a distribution of steam obtained by the Corliss valve gear. It is considered impossible to obtain such a distribution by a single valve, therefore two are employed. The motion is seen to be of the stationary link type and in the illustration the two valves and their separate connections are clearly shown. The link has two slots, one for the block of



HALEY-HABERKORN VALVE MOTION.

the main valve and the other for that of the cut-off valve. There are also two lifters and reach rods connecting to two reverse levers. The illustration shows the engine upon the forward center running ahead, the back up eccentric being directly engaged in moving the upper or cut-off valve which is shown in its shortest obtainable cut-off. The nearer the cut-off lever approaches the reverse lever the longer the cut-off. If the two levers are latched together which may be done by a special clamp, the cut-off valve can perform no functions whatever, the movement of the two valves being exactly the same. The port openings' said to be obtained with 5 in. throw eccentrics, ¾ in. outside lap, constant lead 1/16 in. and with ¼ in. negative lap of the cut-off valve, are as follows:

Greatest port opening	½ Opening.
For 2 in. cut-off.	
" 3 in. "	9-16 "
" 4 in. "	5/8 "
" 5 in. "	11-16 "
" 6 in. "	23-32 "
" 7 in. "	3/4 "
" 8 in. "	25-32 "
" 10 in. "	13-16 "
" 12 in. "	27-32 "
" 15 in. "	7/8 "
" 18 in. "	1 "
" 20 in. "	1 1/4 "
Full port opening.	

We are indebted to Mr. T. H. Haberkorn, of Fort Wayne, Ind., for the drawing from which the illustration was made, and the information relating to the port opening.

REVISION OF STANDARDS OF THE MASTER CAR BUILDERS' ASSOCIATION.

The secretary of the Master Car Builders' Association has recently sent out the following circular addressed to the members of that organization.

The committee on the Supervision of the Standards and Recommended Practice of the Association would be glad to receive suggestions in reference to any such modifications of the established standards and recommended practices of the association as are justified by experience in their use.

For convenience of reference all the standards and recommended practices are enumerated below, although it is anticipated that many of them will be perpetuated without modification.

Such suggestions as have already come to the notice of the committee are referred to under the proper headings.

In replying please refer to the several items by number (The references are to the proceedings of 1895).

STANDARDS.

1. Journal box and details, for journal 3¾x7 in. (page 410, sheets 1, 2, 3). Suggested, that the dust guard shown by sheet 1 for this journal box and that shown by sheet 4 for the large journal box ought to be the same in general design; suggested, that on sheet 3 a note should be added under the illustration of the box lid somewhat as follows: "The lid spring may be of any design and may be secured to the lid by any practicable method, provided that the designated section (2x½ in.) is adhered to." Suggested, that on sheet 3 a note should be added under the illustration of the wedge somewhat as follows: "Skeleton wedges of malleable iron or steel may be used, provided the essential dimensions are adhered to."

2. Journal box and details for journal 4¼x8 in. (page 410, sheets 4, 5, 6). Suggested, that the dust guard shown by sheet 4 for this journal box and that shown by sheet 1 for the small journal box ought to be the same in general design. Suggested, that on sheet 6 (as on sheet 3) a note should be added under the illustration of the box lid somewhat as follows: "The lid spring may be of any design, and may be secured to the lid by any practicable method, provided that the designated section (2x½ in.) is adhered to." Suggested, that on sheet 6 (as on sheet 3) a note should be added under the illustration of the wedge somewhat as follows: "Skeleton wedges of malleable iron or steel may be used, provided the essential dimensions are adhered to."

3. Axle with journals 3¾x7 in. (page 410, sheet 7).

4. Axle with journals 4¼x8 in. (page 410, sheet 7.)

5. Form of wheel tread and flange (page 410, sheet 7.)

6. Distance between the backs of the flanges of car wheel (page 410, sheet 7.)

7. Wheel circumference measure (page 411, sheet 7.)

8. Brake and shoe (page 411, sheet 8.) Suggested, that the lower bridge lug of the brake head ought to be re-enforced by two brackets similar to the brackets F F by which the upper bridge lug is re-enforced. Suggested

the springs come more into play under the action of lateral motion and in running around curves; the tendency to derailment is decreased by the increase of the load on the outer rail when curves are run over at a high rate of speed.

2. Raising the boiler seems to be the most practical, the most simple and the least costly method of increasing engine power, as it allows of the barrel having a diameter greater than the space between the tires.

3. As the boiler does not, on the average, make up more than one-quarter of the weight of an engine, if it be raised a given amount, the center of gravity of the whole is only raised about a quarter of this amount.

4. The center of gravity of the highest engines used at present is much lower than that of passenger carriages and loaded wagons; it can, therefore, be considerably raised without fear of endangering safety.

Stokehold Temperatures in Ships.

The following extract from the official report of the surgeon general, United States navy, will convey an idea of severe conditions under which firemen in steam vessels are frequently called upon to perform their duties. Referring to the cruiser Cincinnati, for instance, he remarks: "Temperatures are recorded from 90 deg. to 170 deg. Fah. Tentative efforts made in November to improve the system, particularly the blowers in fire rooms, have not succeeded in ameliorating the heat now common in those places. I have myself recorded fire-room temperatures as high as 168 deg. Fah. In the engine room lower platform the average is about 102 deg.; on the upper platform it frequently reaches 135 deg. By the present system of forced ventilation for the engine department very little air above the rail is taken. Air is mainly taken through the spar deck hatches; also in part from the after berth deck, and from beneath the deck near the large engine room hatch. Blowers in the condenser room force air to the engine room proper, and those above the upper platform of the engine room pass the air to the fire rooms. When under way a wind sail sends an additional supply of fresh outside air to the condenser room. The supply gotten above the upper

that a rib should be added to the outer edge of the shoe to give it increased stiffness and strength and to secure increased wear from its use. Suggested, that the taper of the tread of the shoe should be made exactly the same as the taper of the tread of the wheel; this would be accomplished if the thickness of the inner edge of the shoe were increased from 1 3-16 in. to 1 5-16 in., the thickness of the thicker edge of the shoe remaining 1 7-16 in. as now.

9. Brake beam (page 411, sheet 8.)

10. Air brakes, general arrangements and details (page 411, sheet 9). Suggested, that the words, "All pins turned to 1 3-32 in. diameter," should read, "All pins finished to 1 3-32 in. diameter;" this would permit of the use of cold rolled pins. Suggested, that the words, "All rods ¾ in. diameter," should read, "All rods at least ¾ in. diameter," as the connection between the cylinder lever and floating lever ought, in general, to be more than ¾ in. diameter. Suggested, that the dimensions of the truck lever connection shown at the foot of sheet 9 are not such as to secure a malleable casting of proper strength, and ought to be modified. Suggested, that on sheet 9, under the title reading "Standards for Air Brakes on Freight Cars," a note should be added reading, "In so far as the construction of the car will admit of their use."

11. Pedestal (page 412, sheet 10.)

12. Automatic coupler (page 412, sheet 11.) Suggested, that the design of coupler on sheet 11 ought to show the distance from back of knuckle to back of horn of draw-head as being 8¾ in., as it is of great importance that all couplers should be made uniform in this respect. Suggested, that the carrier iron shown on sheet 11 conflicts with that shown by sheet B of recommended practice; that the illustration of the carrier iron on sheet 11 should be omitted, and that the last clause of the text on page 412 should be modified to read, "In 1889, the association decided that the opening in carrier iron where draw-head enters should be 5¾ in. vertically and 5½ in. horizontally."

13. Contour line and limit gages for automatic couplers (page 412, sheet 11.)

14. Terms and gaging points for wheels and track (page 412, sheet 12.)

15. Guard rail and frog wing gage (page 413, sheet 12.)

16. Check gage for mounting wheels (page 413, sheet 12.) Suggested, that the report of the committee on mounting wheels may embody some suggestions affecting these standards.

17. Wheel flange thickness gage for new wheels (page 413, sheet 12.)

18. Height of draw-bar (page 413.)

19. M. C. B. reports (page 414.)

20. Pamphlets, catalogs, specifications, etc., (page 414.)

21. Screw threads, bolt heads and nuts (page 414.)

RECOMMENDED PRACTICE.

23. Specifications for cast iron wheels (page 418.)
 23. Guarantee for cast iron wheels (page 419.)
 24. Limit gages for round iron (page 420.)
 25. Check chains (page 421.)
 26. Marking cars (page 421.)
 27. Air brake repair card (page 422.)
 28. Protection of trainmen (page 422 sheet A.)
 29. Buffer blocks and location (page 423, sheet A.)
- Suggested, that buffer blocks on freight equipment cars should be placed 26 in. apart, center to center, instead of 22 in. as now, making it unnecessary to cut away the corners of the buffer block to clear the guard arm of the M. C. B. coupler, and making the spread of the buffer blocks on freight equipment cars the same as the usual spread of buffer stems on passenger equipment cars.
30. Platform safety chains (page 424, sheet A.)
 31. Attachment of couplers to cars (page 424, sheet B.)
- Suggested, that with the dimensions given it is impossible to obtain a draft spring of more than 20,000 lbs. capacity (the standard reads 22,000 lbs.), and that, therefore, the standard requirements out to be reduced from 22,000 lbs. to 20,000 lbs.
32. Loading logs, poles and bark on cars (page 424, sheet B.)
- So many different suggestions have been made that the committee on standards advises the appointment of a special committee to investigate this subject and to report at the convention of 1897.
33. Marking fast freight line cars (page 424, sheet B.)
 34. Journal bearing and wedge gages (page 425, sheet C.)
 35. Safety chains for freight cars (page 425, sheet C.)
 36. Minimum thickness for steel tires (page 425, sheet C.)
 37. Dummy coupling hook (page 425, sheet C.)
 38. Air brake tests (page 425.)
 39. Air brake and signal instructions. These are not included among either the standards or recommended practices of the association as given in the proceedings, but are embodied in a separate pamphlet entitled "Air Brake and Signal Instructions as Approved by the Master Car Builders' Association and the American Railway Master Mechanics' Association, June, 1892." Suggested, that these air brake and signal instructions need to be revised, and that therefore the association should appoint a special committee and should request the Master Mechanics' Association to appoint a similar committee, with the understanding that these two committees, working as a joint committee, should revise these air brake and signal instructions, and should submit the revision to the two associations at the conventions of 1897.
- Replies should be addressed to R. H. Soule, superintendent motive power, Norfolk & Western Railroad, Roanoke, Virginia.

Engineers' Club of Philadelphia.

At a regular meeting of the Engineers' Club of Philadelphia held March 7, Dr. Henry Leffmann described the construction of the Croton aqueduct of New York, and also ancient methods of plumbing. These were illustrated by lantern slides. New York has adopted a system of water supply similar to that used by the largest city of the ancient world. A view of the Croton river watershed was shown, the total distance of the extreme point from New York being about 50 miles, though not all of this is included in the aqueduct construction. Quite a number of different lakes and streams are included in this territory, and a considerable amount of material, some residences, etc., had to be removed to preserve the purity of the water. Recently serious complaint has been made about the quality and quantity of the supply. The drouth of last year very seriously imperiled its sufficiency, a danger that is likely to threaten a system of this kind. The water of the Schuylkill river when it is clear is quite as pure as the Croton water, so that it would appear that New York has not yet solved the water problem.

A view of the series of eight 48 in. iron pipes running side by side along Convent avenue was shown to explain this feature of the aqueduct. The cross section of the masonry aqueduct was commented upon as differing in shape from the sections used in the Roman aqueducts, the former being curved at the top and sides, while in the latter the upper portion was generally peaked or slightly curved, while the sides were vertical. Views of the reservoirs, gate houses, etc., were also shown.

Dr. Leffmann then described some pictures illustrating the plumbing of ancient Rome, taken mostly from the plates in a volume by Lanciani on the water supply of Rome. The ancient method of making lead pipe was to fold a sheet of lead into the form of a cylinder and solder the edges together where they joined. Very often the pipes were marked with the name of the plumber, some of the latter being women, who had probably continued the business of deceased husbands.

Some of the wealthy Romans had water led by these pipes into their houses, while others drew their supply from the public fountains. There were stringent laws regarding cleanliness in the use of the latter. Terra cotta pipes were also used with elbows and fittings of various shapes. In this department of construction, however, we have no evidence of the delicacy or artistic talent that is displayed in the architectural work of the Romans. It was probably done by a very inferior class of artisans.

Dr. Leffmann then exhibited a slide representing the outlines of the city of Philadelphia, marked with spots indicating the location of each death from typhoid fever that occurred during 1895. As the cases were very evenly distributed throughout the city, they were doubtless due in large measure to the impure water which our citizens have been obliged to use. Girard college was pointed out as a good example on a small scale of the improvement caused by pure water, for, while it lies in the middle of a very bad district, it has practically exterminated typhoid fever from within its boundaries by filtering its supply. This map was prepared from the records of the board of health giving the location of each house where a death occurred.

Although the typhoid death rate in Philadelphia is falling off, the decrease is probably not due to improvement in the water supply, for nothing has been done to effect this desirable result; but it may be that the most susceptible element is gradually being killed off. The death rate, though less than 4-10 per 1000, is much higher than in some

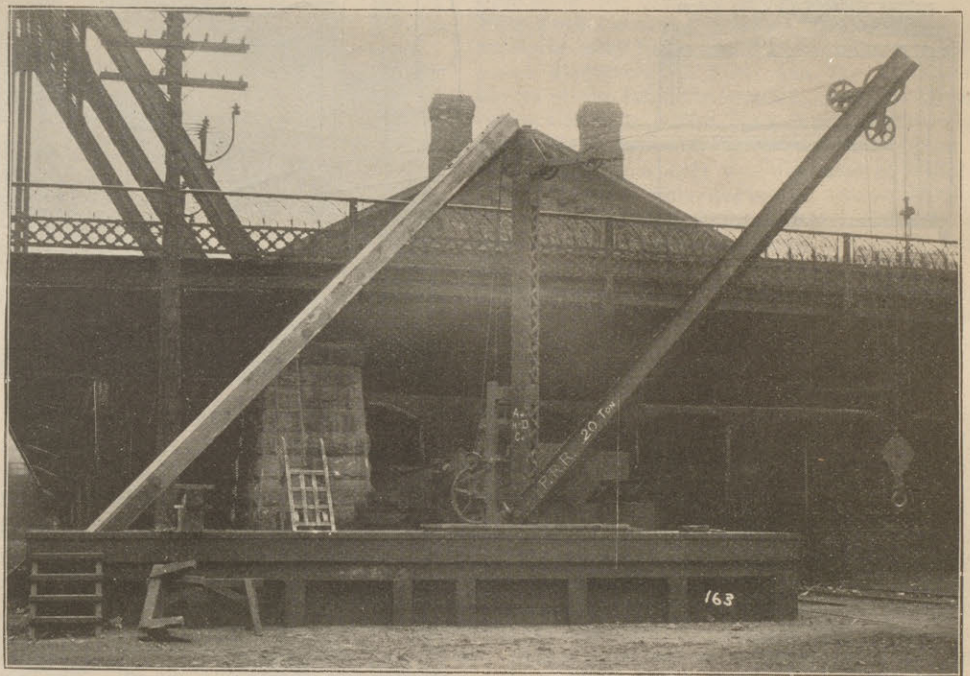
other large cities of the world. London, for instance, with its enormous population, has only about 600 deaths per year while last year we had 450. Of those taken sick with the disease about 10 per cent die, so that there were probably 4,500 cases of typhoid fever in the city. Dr. Leffmann stated his belief that the typhoid rate would drop over 50 per cent in the first year that we filtered our water supply, though it would of course continue abnormally high in certain places on account of milk supply, sewage or other local causes.

The Technical Club.

The committee on quarters for the Technical Club of Chicago has arranged to occupy all but the street floor of the building number 228-230 Clark street, after necessary improvements have been completed, which will probably be about June 1. A lease has been signed with Mr. L. Z. Leiter for a term of ten years and the convenience of the location, opposite the post office, and the completeness of the arrangements which Mr. Leiter is to make for the club would seem to settle the question of quarters very satisfactorily. Among the improvements to be made in the building is a roof garden, and it is stated that every thing will be done to render the rooms convenient and attractive. The incorporation of the club has been completed and the outlook for a successful career seems to be propitious.

TWENTY TON DERRICK—PENNSYLVANIA COMPANY, CHICAGO.

The accompanying illustration is reproduced from a photograph of a 20 ton derrick in use in the Pennsylvania Company's yards at Jackson street, Chicago. It is very convenient and powerful. The mast or upright is a latticed steel post and is supported by two heavy wooden timbers. The radius of the boom can be varied at will and its maximum reach from the center of the post is 30 ft. The hoisting and boom lines are both $\frac{1}{4}$ in. pliable "Hercules" wire rope which will easily support a load of 20 tons.



CRANE IN PENNSYLVANIA COMPANY'S YARDS, CHICAGO—AMERICAN HOIST & DERRICK COMPANY.

The boom will swing through about three-fourths of a full revolution. The greatest advantages in the use of this style of derrick are its extreme simplicity and low cost, the one shown herewith having cost, in place, only about \$1,000. It is a hand power crane but electricity or steam can readily be applied if it is desired. The derrick was built by the American Hoist & Derrick Company of St. Paul, Minn.

THE HAULING CAPACITY OF LOCOMOTIVES.

An abstract of a paper by Mr. H. H. Vaughan, mechanical engineer of the Great Northern Railway, entitled "The Hauling Capacity of Locomotives," read before the Northwest Railway Club, was published in the RAILWAY REVIEW of January 25 of the current volume, and the subject was discussed by that club at its February meeting. Extracts from the discussion are as follows:

Mr. Vaughan—I made a statement in the paper that in some of our tests we had found the resistance per ton to be from four to five pounds, and as one or two people have spoken to me about it, I thought I would bring up the particular test from which I made the statement. In 1892 we tried one of our consolidated engines, running up a hill out of Willmar, where the grade for about twenty-six miles is a 6-10 grade. We started the train over a set of switches; she was partly on a grade when she started, but she was practically with no speed. The engine brought the train over the grade at about four miles an hour, and the total weight of the train with engine was 1,693 tons; the steam pressure on engine was 175 lbs. Taking the full tractive power, allowing nothing for friction on the engine, or back pressure, or anything of that sort, only leaves a little over $5\frac{1}{2}$ tons for train resistance and engine resistance. Taking the engine at 92 per cent, which I think is very fair, it leaves about five pounds per ton for train resistance; and in this case, I think, we are justly entitled to say that the train resistance did not come much over five pounds per ton. We had the cars all loaded; we thought it was about as heavy a load as the train could haul, and I think that will probably substantiate my

statement. I know that some haulage sheets are made out for each class of engines, and I think it is rather useless to put too fine a point on that; the most we can do is to give the average rating. There are so many things which will lower the rating, that must be allowed for, that I do not think that it is a good thing to make it too close. We have on our road statements made up for each week, right along throughout the year, giving the amount of tonnage from our terminals, on the freight runs, in the direction of the prevailing business; that is to say, taking between St. Paul and Melrose, if the prevailing business were westbound the tonnage would be shown on the westbound trains only, and then taking the engines that pull the train and the rating for each engine in that list, we can find out what percentage of the haulage capacity has actually been pulled by the engines on that division, and it not only gives you the test of whether the engines are being worked up to their full capacity in the busy season, but it shows whether any repairs are being needed with the whole train tonnage at once. In some places we have hauled above our haulage capacity sheets; that has been on very level divisions, where we really haven't made allowance enough for the speed of the train. The allowance we made in that paper was about 20 miles per hour, and others will exceed that rate where they have a little help up a hill by a down grade a little in front of it; but those sheets show that where we have adopted, as I said, in one case, a rating of 90 per cent on a grade that is about 20 miles long, we have pulled up within 15 per cent of the rate per ton on the sheet throughout the week; and on the western part of the road, on a 2 to 2-10 grade, where we have adopted a rating of 180 per cent, we have pulled up 99 per cent and 110 per cent, and so on throughout the week. It gives a very good test of the correctness of our sheets; of course, we are always liable to get left a little where we have to make the train up to the full rating. Of course, regular trains must be run whether they are quite up to the rating or not, and in one or two cases the statements were spoiled where there was much of it.

Mr. Tracy Lyon (C. G. W. Ry.)—The Great Western Railway has had a system of tonnage rating on all parts of its line in successful operation for about two years, and it is in the light of this experience that I speak.

In Mr. Vaughan's very excellent paper on "The Haulage

Capacity of Locomotives," the statement of the principles involved is a clear one, and his deductions as to train resistances agree, in the main, with the results of our experience; but while a theoretical exposition of the haulage capacity of locomotives based upon the grade and curvature of the track, is relatively valuable, I do not consider that, as a means of establishing the tonnage rating in actual practice, it can be depended upon. The number of physical conditions which must of necessity, enter into such a problem are such that practical results cannot be so arrived at. It is hardly necessary to dwell upon what these conditions are, consisting as they do of all possible combinations of gradient and curvature variously affected by the location of stations, bridges, crossings and switches, as well as the quality of the track. It also may be said that the profiles are not to be depended upon to furnish the actual grades, as the track is constantly being worked upon and constantly settling.

Such calculations are, however, valuable in analyzing the results obtained from actual tests, and in modifying such tests to suit other classes of engines and varying conditions of rail and weather. This has been the method pursued by us. After a long series of experiments we have divided the road into a certain number of sections, according to ruling grades, stations and other conditions, and established by tests the actual hauling capacity in tons of one class of locomotives at least over each section under favorable conditions. These sections differ in their limits for each direction, and vary in length from 6 to 75 miles. The hauling capacity for one class of locomotives having been determined, the corresponding capacity of the other classes in use is arrived at from a comparison of their traction, figured in the usual way. From the point of view of our experience I can hardly agree with Mr. Vaughan in saying that it is cutting the thing too fine in making a distinction between the different classes of locomotives, if I understand him properly. We expect our locomotives to work within a very small percentage of their rating and they do it. Instead of making a horizontal reduction of a certain percentage for bad conditions of weather and rail, as indicated in Mr. Vaughan's paper, we add to the train resistance, corresponding to a certain rating, two pounds per ton to obtain what we call second rating—that is to say, for an inferior condition of rail and weather;

and 4.4 lbs. to arrive at the third or still inferior rating, representing the most unfavorable conditions ordinarily met with. By obtaining these ratings in this way the decrease in the rating is proportionately less as the load decreases, and this would seem to be a better principle than that of making a horizontal decrease of a certain percentage, which would make a proportionately greater reduction in a smaller train than a larger one.

We also make a reduction of from two to ten per cent in the rating for empty cars, these figures being based on the assumption that the wheel resistance per ton of an empty car is one-third greater than of a loaded car, or as eight pounds is to six pounds.

The principle advanced in Mr. Vaughan's paper of increasing the weight of an empty car to allow for empties in making up the tonnage of a train is, I think, a sound one, but it results in obtaining a tonnage which is not in accordance with the actual facts, and if the ton miles so obtained are to be used for any other purpose, as we use them, it would be very inconvenient, and we, therefore, did not, although we considered such a method, adopt it, but preferred the horizontal decrease which we find works very well.

Our maximum reduction in rating for empties is, 10 per cent, that is, with a train of all empties.

We are still continuing our tests of hauling capacity, and we find from time to time that we can increase our rating. In some cases we are able to do this because of an improvement in the condition of motive power, and in other cases from the reduction of grade, easing of curves, omission of stops, and one thing and another.

Mr. Vaughan has referred to-night to making a weekly statement of how near the loads hauled have approached what the tonnage sheet calls for. That is a very important point, as when a consistent tonnage rating has been established, only the first step has been taken. The next thing to determine what is being done and how near the standard is being approached. We have a daily statement showing the tonnage of every train, upon which is shown the actual cost of the wages of engine and train men per 100 ton miles in the direction of greatest traffic, as compared with what these wages would have been 100 ton miles if the full rating had been hauled. A separate statement is made for each division.

Our dispatches are held very rigidly to account in this respect, as in their hands lies the decision as to what rating shall be used. The yardmasters have standing orders that they shall load all trains to first rating in the absence of other instructions. The weight of each car load, both car and contents, is in the first place inserted in the way-bill by the agent. Fractions are not used; less than 1,000 lbs. being dropped, and over 1,000 counted as one ton. This information is shown on the switch list used by the yard men in making up a train, empties being given on arbitrary weight depending on the class of car. The weight of the cars and their contents having been inserted on the conductor's report, is certified to by the agent, and we find no difficulty in checking this so that we are very sure of the results. This information is sent to the dispatcher at once so that he may know what the rating is, and at all stations where cars are set out or picked up the change in tonnage is reported to him. In order to be informed as to what the rating should be, the dispatcher receives a telegraphic report of the weather and condition of rail from all stations twice a day.

We have recently been making some tests by taking a train, usually of a thousand tons, and sending it over one or two divisions with a helping engine behind, and by use of a speed recorder and very careful observations we obtain the information which will enable us to increase the rating, or to know what changes in grades or other physical conditions are necessary to reach the desired results.

E. A. Williams (Soo Line)—On May 1, 1895, the Soo Line commenced rating its locomotives on the tonnage basis. The rating (in tons) for each class of locomotive, between each station on the several divisions, was based on the actual weight of the train that an engine in good condition, worked to its full capacity, with all conditions favorable, had previously hauled. We have what is known as "first," "second" and "third" rating, all in tons to suit the different conditions of engines, weather, rail, etc.

The coal consumed by locomotives for eight months in 1895, May to December inclusive, while rating engines on the tonnage basis, as compared with the same months in 1894, shows a net saving of \$16,807.28, or a trifle over \$2,100 per month. The cost per mile of hauling freight cars in 1894 was one and eighteen one-hundredths of a cent, and in 1895 it was 1 cent—difference of eighteen one-hundredths of a cent. This difference, multiplied by the freight car mileage for 1895, namely, 36,543,908 miles, making a net saving of \$65,779.03. Our increase in loaded cars hauled in 1895, as compared with 1894, was 144-100. The repairs of locomotives during the eight months in 1895 (in which they were operated on the tonnage system) increased to some extent, but in shopping locomotives for repairs we do not consider so much the mileage that an engine has made as we do the tons of freight it has moved. When a locomotive shows an indication of weakness—leaks in fire-box or tubes, the repair shop is the proper place for it, instead of on the road hauling trains with reduced tonnage, and, in consequence, consuming additional fuel, the cost of which in a few trips would pay for renewing tubes and other light repairs.

A great deal has been said by master mechanics, foremen and locomotive engineers about the disastrous results produced on fire-boxes and tubes by overloading locomotives. I believe this is a "bug bear," with very little foundation in fact. There is a happy medium between running locomotives over the road with trains less than their maximum tonnage and "overloading," and, as Mr. J. H. McConnell in his very valuable paper on "Locomotive Service" says, "An increase of one car containing 20 tons of freight in each train will increase the earnings of a locomotive in one year \$7,200, and the only additional expense would be 90 tons of coal." With these facts before us, it would appear to me that officials at the head of locomotive departments should aim to shop engines as often as it may be necessary in order to obtain the most economical results.

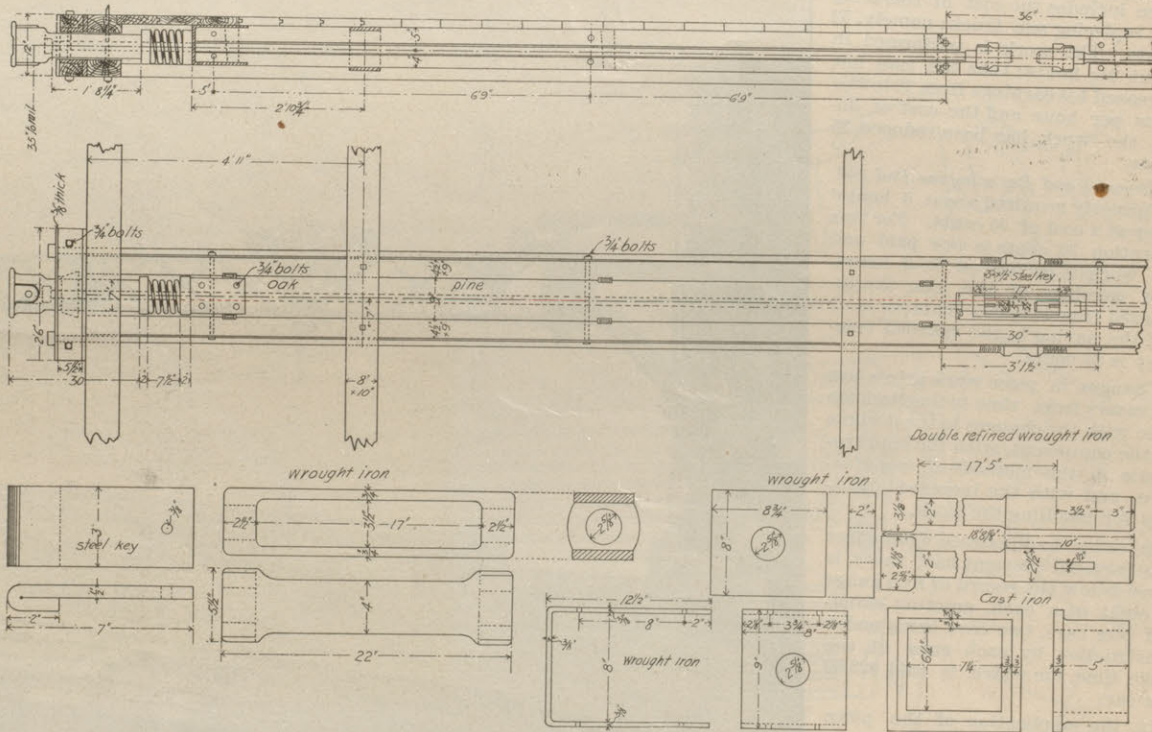
I believe the average cost per mile for operating loco-

motives is between 18 and 20 cents. Now, for example, let us suppose it costs 25 cents per mile to operate locomotives, and the cost per mile for moving loaded freight cars is ninety one-hundredths of a cent. Is there any question but that the results obtained would more than justify the additional cost of repairs?

DRAFT RIGGING—DENVER & RIO GRANDE RAILROAD.

The fact that by far the largest expense in maintaining freight equipment is due to the weakness of draft rigging, has led to many efforts to so design this part of the equipment of a car as to produce a mechanism strong enough to withstand the severe shocks of service, and also to arrange the parts in such a way as to bring the shocks upon members properly placed to receive them. Among the excellent designs of draft gear which have been found in service to meet the requirements, the arrangement illustrated herewith seems to be one of the best. It embodies the principles of directness in both pulling and buffing stresses and makes use of the continuous draft gear principle as well as the direct transmission of buffing stresses by means of what are practically continuous timbers.

We are indebted to Mr. T. R. Foster, mechanical engineer of the Denver & Rio Grande Railroad for drawings from which the accompanying illustration was taken. Ordinary link and pin draw bars are shown in the illustration which are passed through the deadwoods through cast iron timbles. The couplers are connected by means of a 2 in. wrought iron rod composed of two parts with a swivel connection at the center and with large heads at the ends. These heads are seated in recesses in the inside of the mouth of the coupler in such a way as to transmit the stresses from the coupler ends rather than from the shanks. The couplers have no tail bolts or straps but bear directly against the



DRAFT RIGGING—DENVER & RIO GRANDE RAILROAD

follower plate of 2x8x8½ in. iron. It will be seen that this arrangement does away with the danger of pulling out a drawbar in case of the breakage of the shank, as in this case only the head could be pulled off owing to the presence of the large rod running directly through the coupler. Another interesting feature is the buffer timbers which are placed between the center sills and run the entire length of the car between the inside draw bar follower plates and against which these plates bear. These timbers are divided at the transoms and are of oak up to the transoms while between them pine is used. The ends of the timbers are faced with wrought iron plates ½ x 8 x 32 in. which are bent around the end of the timbers as shown in detail drawing and in the vertical section. These plates are drilled for the draft rods and are secured in place by four ½ in. bolts. The buffer timbers are bolted to the center sills by means of twelve ½ in. bolts and are further secured by 12 cast iron keys driven vertically into key seats cut ½ in. into each timber. The buffer timbers are made in two halves longitudinally and they are rabbeted on their inner faces to enclose the draft rod. The arrangement at the center of the car whereby space is left for the swivel connection in the draft rod is clearly shown in the drawing.

The length of the draft rod when put together and when the keys are placed through the swivel in the center, is made so as to compress each draft spring ½ in. For the purpose of separating the rod for repairs or other purposes, a rectangular hole 9 x 36 in. is cut in the car floor and into this a piece of oak is fitted which is of the same thickness as the flooring. Mr. Foster states that with a draft rod made of good material and when proper care is taken in giving the tension specified for the draft springs, this arrangement will stand the roughest usage and in fact failures of draw bars or draft rigging are

rare, where this construction is used. It is evident that encasing the draft rod in this way prevents it from falling upon the track in case of wrecks which is another point favorable to this construction.

PIECE WORK IN CAR SHOPS.*

G. L. POTTER.

The manufacturing and repairing of the parts of locomotives under the piece work system had been practiced a number of years before the system was applied to car work, especially to the repairing of cars. This was due probably to the fact that the amount of money expended on locomotive work is so great per unit; that is, per engine built or repaired, and the labor such a large percentage of the total cost; in new work being about 45 per cent and in repair work from 65 to 70 per cent while the cost of labor in building new cars is only from 12 to 15 per cent of the total cost and in repairs from 45 to 50 per cent. It is also due to the fact that, on account of the much longer time required to perform the different operations on locomotive than on car work, it is much easier to determine the prices that should be paid, and with much less danger of error.

This trouble in determining the prices to be paid is not so great in building new as in repairing old cars. In new work it is customary in some cases to place prices on the body complete with all the trimmings; c. e. doors, grain doors, air brakes, etc., applied; in other cases the work is divided up and given out to different gangs of men, one gang constructing the foundation, another laying the floor, another putting up the upper structure, another putting on the sheathing, another the roof, etc., so that it requires from one half to a day and a half in the first case, and an hour to five hours in the second, to complete the different operations; consequently the amount of time that should be required is comparatively easy to determine. This is also the case in manufacturing the parts for new work. While each piece can be manufactured in a comparatively short time, they are usually gotten out in large quantities, so that the time required to produce each piece is readily determined

In repair work the conditions are different. Different cars will require different parts to be repaired, so that it is necessary to establish a price for removing and replacing and repairing each part. The difference in time required to remove the corresponding parts on different cars (even though they be of the same design) and the difference in the time required by different men to perform the same work, and the getting out of the parts in small numbers are the main difficulties encountered in arriving at prices that are fair to both employer and employee. This can be accomplished only by thorough and careful investigation extending over considerable time and averaging as many performances of the different operations as possible. When the work has been carried through to a successful issue the results will well repay for the labor expended.

The benefits of the piece work system accrue not only to the employer but also to the employee; to the former in that he pays for the work performed only what it has been found to be worth, can more easily locate and weed out the incompetent workmen, and with given facilities, will materially increase the output of the plant; to the latter in that he is paid for what he actually does and by increased exertion can increase his earnings, and the more competent workman is enabled to reap the benefits of his greater earning capacity.

There is probably more supervision required under the piece work than under the day work system, in the first place to see that only such parts that actually require it are repaired. There is a great tendency on the part of workmen to renew more parts than are actually necessary, especially if by doing so the earnings can be increased. To provide against this it is customary to have the car thoroughly examined before being taken into the shop by a competent inspector who notes on a blank the work to be done, and only such work as is so noted is allowed to be done without the permission of the foreman in charge. In the second place the cars should be carefully inspected after completion to see that all the work called for on the blank has been done and done in a proper manner, the inspector checking the items called for on the

Abstract of a paper read before the Western Railway Club, Feb. 18, 1896.

blank upon which the parts to be repaired have been entered against the parts repaired on the car. In the third place there is danger of material being wasted by unscrupulous workmen, especially if parts can be removed more quickly and easily by destroying them. This is particularly the case in truck work, where it is easier to break the bolt off than to take off the nuts.

In starting the piece work system in a railroad shop, the first impression that is usually formed in the minds of a workmen is that it is a scheme to reduce wages. It is necessary, therefore, to successfully establish a system, to disabuse their minds of this idea and to have them feel that the benefits will be mutual. Failures to introduce the system successfully, where it has been undertaken, can, I think, be traced in the majority of the cases to unfair dealings on the part of those in charge, by reducing the prices when it was found that by extra or unusual exertions the workmen were unable to materially increase their earnings, thus discouraging them and causing them to look upon the scheme with suspicion.

When the piece work system has been established on a fair and equitable basis, it will be found that the cost of the output will be very much reduced, the workmen will be enabled to increase their earning, and there will be much less dissatisfaction among them, and a great stride in the solution of the labor problem will have been made.

To illustrate how both the employer and employee are benefited under the piece work system, we will show the cost of repairing three important items on freight cars when performed under the day rate and under this system.

Removing and Replacing one Draft Rigging.—Under the day work system it required about six hours' labor at 19 cents per hour. The cost of the operation was \$1.14. The piece work price for this item is 90 cents. The work is performed in about four hours, thus increasing the earnings of the man from 19 to 22½ cents per hour, and resulting in a saving to the railroad company of 24 cents.

Removing and Replacing one Body Bolster.—Required under the day work system about 10 hours, at a cost of \$1.90. Under the present system of piece work, the body bolster is removed and replaced for \$1.05. This price includes the cost of removing and replacing one truck; namely, 52 cents. The work is performed in about 4½ hours; thus the man has increased his earnings from 19 to 23½ cents per hour and the cost of doing the work has been reduced 85 cents.

Removing and Replacing one End Sill.—Formerly required about 5 hours' labor at a cost of 95 cents. For this operation 70 cents is now paid and the work is performed in 3 hours. The earnings of the man are increased from 19 to 23½ cents per hour and the saving to the railroad company is 25 cents.

Changes in piece work prices are necessary from time to time to keep pace with the changes in the designs of the equipment, with the improvements in the methods of manufacture, and with the increased facilities for handling the work.

In order to illustrate what effect the personal element has, there is given below the record of five gangs of eight men each, erecting standard box cars, two cars being under construction by each gang at the same time, for which is paid \$22.50 per car.

In the application of the piece work system to car repairs a car is "cut out" by an inspector in the yard and marked "for shop" and is set in the shop yard. It is then examined by an inspector who notes on a standard form or card the parts of the car to be repaired. This card after being filled out is given by the foreman to the gang leader who is looked to see that the work authorized is properly done. [The card is illustrated in the paper.—ED.]

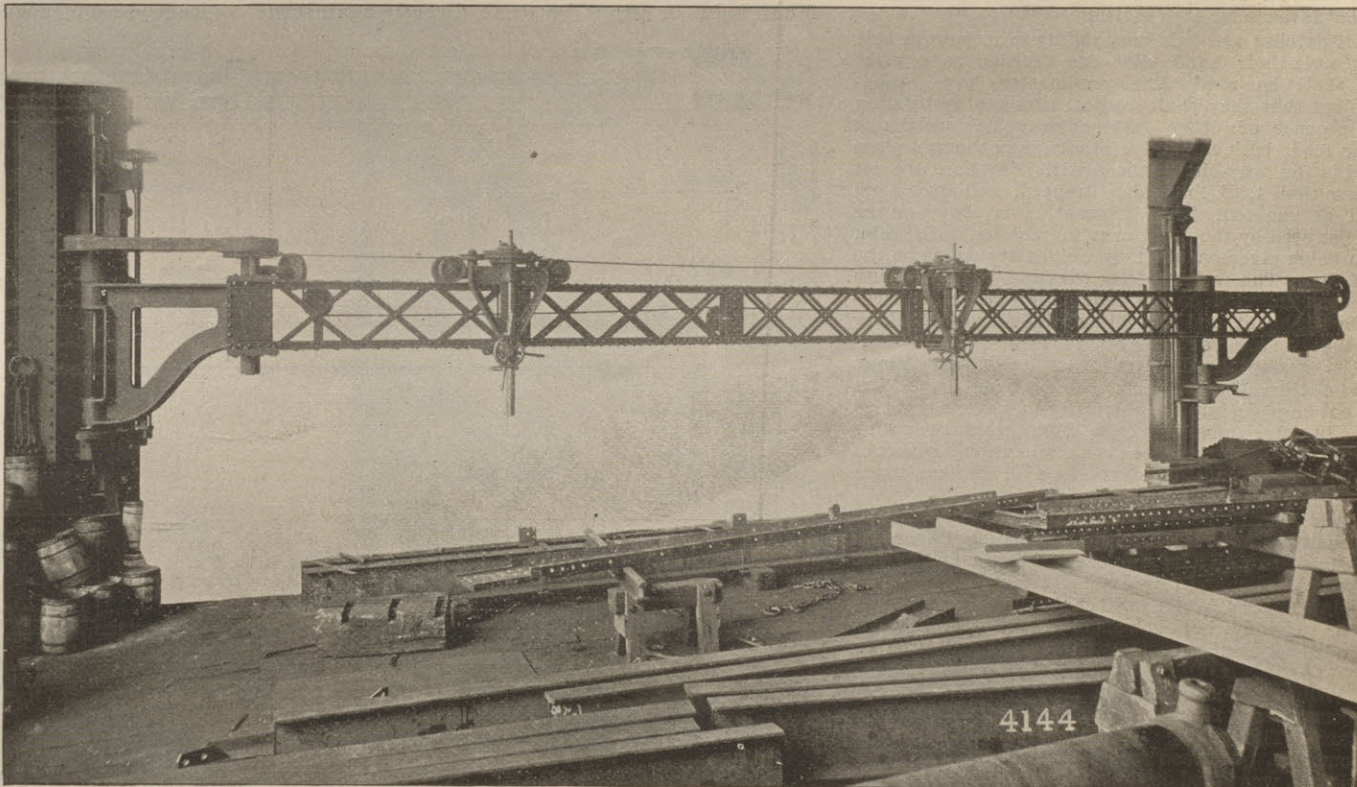
After the work has been completed and inspected, the card is priced by the foreman and turned into the shop clerk's office with the names and rates of pay of the men who have worked on the car, and with the number of hours that each man has worked, and the earnings are distributed to the credit of the men on this basis.

When the cost of work by outside car shops is compared with that done by the average railroad shop, it would at first seem discreditable to the shop management of the latter, but when the disadvantages which the ordinary railroad shop is working under are considered the cause of the apparent discrepancy will be readily appreciated. A large number of old employees with the high rates of pay paid skilled mechanics in the early history of railway work is a legacy which has been handed down to those now in charge of many railway shops which were established many years ago. When railroad companies first found it necessary to repair their own cars few of the facilities which are now in use were in existence; only the simpler and cruder forms of tools were known. This condition of affairs made necessary the employment of skilled mechanics on car work, while to-day such skill is unnecessary as with the more modern tools and appliances the parts are produced ready to be put in place, which can be done by practically unskilled workmen. To give an instance: At one time it was supposed that the boring of wheels and the turning of axles could only be properly done by one who had thoroughly mastered the machinist trade. In many shops this class of men who have been doing this work for many years are still in the service, making it necessary to pay much higher prices for the work they perform than would be necessary if younger men, and men suited for the work were employed. It was not uncommon a few years ago to find in many shops the price paid for turning the axle of a 60,000 capacity car from 35 to 45 cents each. Today the same axles are being turned at a cost of from 15 to 20 cents each. A bright laborer with good tools

and proper instructions can be taught to turn out axles well machined up to the full capacity of the machine in from three to six months and at the prices for axles mentioned above, can earn from \$1.50 to \$2.50 per day.

SWINGING DRILL FOR GIRDER WORK.

The days in which one machine is depended upon for doing a great variety of work have about gone by, and nearly everything in the machine line has become special. We have special lathes, special planers, and special drill presses, each fitted for doing one kind of work only and turning out a quantity which leaves the old style of machinery entirely out of the race and makes life a dreary struggle for the man who tries to get work out of it at figures which will command business. The amount of girder construction which has been carried on in recent years has been so great that we now have a line of machinery specially adapted for handling this class of work. By far the greatest amount of machine work required in such construction is performed by drill presses, and therefore the accompanying illustration will be of interest to those having it in charge. The main object the designers had in view was that of obtaining a powerful drill which could be quickly moved from point to point, and for this purpose any desired number of heads are mounted on a girder and the girder attached to swinging arms all of which may be of dimensions suitable for the work in hand. The machine shown herewith has two heads, the length of the girder is 39 ft. 4 in., the radius of the arms is 7 ft., and the vertical traverse of the girder is 5 ft. This makes a machine of wide range in both the length and width of work it will cover, and as the drill saddles can be easily moved along the girder the adjustments can all be made in a very short space of time.



SWINGING DRILL FOR GIRDER WORK.

The spindles are driven by a rope which extends the full length of the girder and is driven by a leather belt at one end.

The arms are heavy and rigid and are raised and lowered by means of a screw attached to each column and driven by belts. They are gibbed to their supporting shafts and these shafts are provided with a clamping attachment by means of which they can be secured after having been adjusted. The drill spindles are of steel and all gearing is cut and made of semi-steel.

The machine is built by the Niles Tool Works, of Hamilton, Ohio, and is in accordance with the practice of that company, made with sufficient strength and power for turning out the maximum amount of work.

Good Locomotive Mileage.

Considerable interest having been expressed in recently published records of locomotive mileage the following is quoted from Locomotive Engineering, giving record of class P locomotive number 2106, running on the Pennsylvania Railroad between Harrisburg and Renova on the Susquehanna division N. C. and Eastern division P. & E., on passenger trains Nos. 3 and 6, varying in length from four to sixteen cars: "This engine was built at Altoona shops, June, 1893, and put in service July 1, 1893, and was in continuous service until January 31, 1896, when the engine was taken out of service and sent to Renova shops for general repairs. This engine made during this time the following mileage:

"For 1893 47,956 miles. 1894, 101,214 miles; for 1895, 102,175 miles; and January, 1896, 5,075 miles, making a total of 256,420 miles. The engine during this time gave no trouble with leaking flues."

NOTES ON OVERLOADED WHITE PINE.

JUSTIN BURNS.

The results of laboratory tests are easily obtainable showing the breaking loads of full sized timber; but the complete data of overloaded or excessively strained structures are not as readily procurable. Consequently it may be of interest to observe how great a strain is sometimes placed upon timber in overloaded structures. There is on one of the western railroads in the yard of one of its principal stations, a combination Howe truss bridge of three spans of 175 ft. each and 12 panels to a span. The bridge is used only for freight trains and switching purposes and has been condemned by the engineering department, but on account of peculiar circumstances and conditions the management requires the maintenance of the structure.

The floor system consists of 6x8 in. pine ties placed on eight 7x16 in. stringers, three under each rail and two jack stringers. The stringers are supported at each panel point by three 7x18 in. white pine floor beams. The distance between centers of trusses is 16 ft. At some of the butting joints, the ends of the stringers have rotted so that they convey their load to the outside floor beams only; the continuous stringers at the same panel points are also considerably rotted so as to convey little load to the middle floor beam. This throws nearly all the strain on the outside floor beams; and in one case (due to repairs) the stringers are all butting joints at the panel point and convey all their load to the outside floor beam. Under the loads to which the bridge is daily subjected, the maximum stress per square inch in the outer fiber of the floor beam is 4,950 lbs. There have been numerous failures of floor beams in this bridge, and almost invariably a check would start on

the lower side of the beam and under the rail, and after cracking vertically two or three inches, the timber would split horizontally. Yet there are some of the floor beams of rather poor quality and full of knots which for more than a year have sustained this stress of practically 5,000 lbs. per square inch. The only evidence of overloading is the presence of more horizontal checks than season checking would cause.

Another instance of excessive loading is that of a 14 ft. span in a pile trestle whose deck consisted of 6x8 in. oak ties, on six 7x14 in. white pine stringers, two under each rail, and two jack stringers. In this case one of the two track stringers under one rail was so badly rotted as to convey no load to the bent, thus leaving the other stringer to be the only support. The stress in the outer fiber in the stringer caused by the engine wheel loads was 2,940 lbs. per square inch; while under a 60,000 capacity car, the stress was 3,220 lbs. The working stringer showed no signs of failure.

There are other cases which could be cited showing pine timber working under a stress two or three times in excess of the customary unit designing stress of 750 lbs. per square inch in the outer fiber; the successful performance of the structures under these excessive stresses would lead to the discussion of the advisableness of raising the present unit stress.

The China order for wheels, axles and springs has been placed in England, in competition with French, German and Belgian makers. Tenders were telegraphed from London to Tientsin on the 10th inst., at 6 p. m., and acceptance was received at 11:26 the next morning in London. Quick work for any country, particularly for China.

ANOTHER BIG UNION STATION FOR BOSTON.

Following the lead of the northern lines running into Boston, the New York, New Haven & Hartford, the Boston & Albany and the New York & New England lines have agreed upon a plan for building a new union station to accommodate the passenger business of all of these roads, and the lay-out of the tracks which has been agreed upon is shown in the accompanying illustration. The site settled upon is at the foot of Summer street, and a number of streets are to be changed or abandoned. The plan calls for an entire rearrangement of all the terminals of what are known as the Southern roads. In the illustration the dotted lines show the present arrangement of tracks and streets, the heavy lines indicating the new plan, upon which are shown the changes in the arrangement and width of the streets. The most important of these are the abandonment of Federal street from the corner of Atlantic avenue to the bridge over Fort Point channel, which crosses the site of the train shed and terminal tracks. Dorchester avenue is to be continued and carried along the channel at the east side of the terminal grounds. In this plan Kneeland street runs very nearly east and west. Portions of several streets are to be abandoned west of the station in order to give ample approaches thereto.

The following description is believed to be correct up to date: The present Park Square station of the Providence division of the N. Y., N. H. & H. Railroad, together with the freight yards and houses adjacent thereto will be abandoned and the trains from that division are to be run into the terminal station

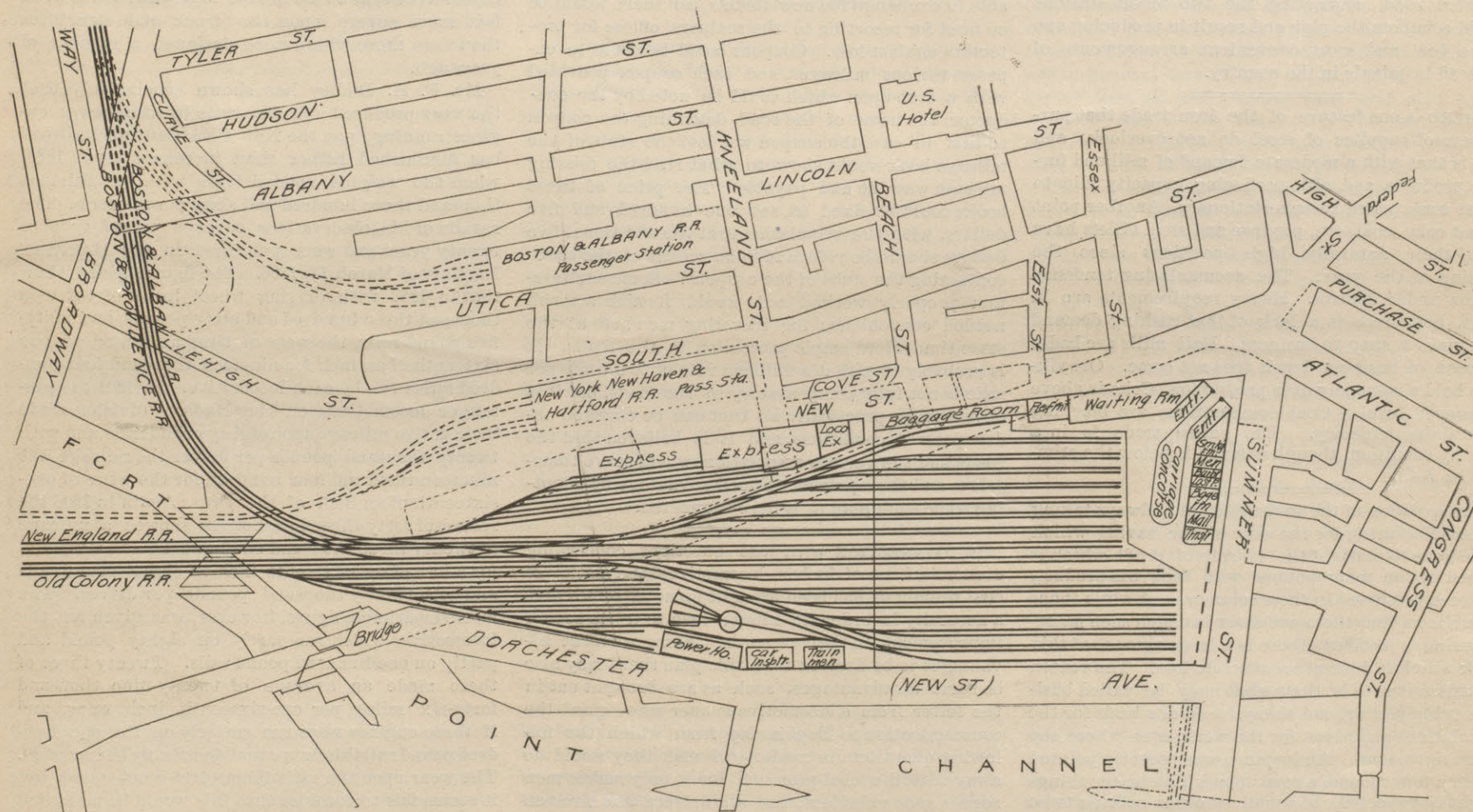
through which carriages can be driven directly into the station. The general waiting room is to be 300 ft. long, 75 ft. wide and 30 ft. high, with three entrances on Cove street and one through a passage way from the main entrance. The room will be divided into alcoves about 15 ft. wide with seats arranged on three sides. The ticket office will be located between the general waiting room and the train house accessible from both sides. The building is to be fire-proof throughout. That portion of the train house extending to Summer street is intended for the general exit of passengers coming from in-coming trains which will enter the station on the east tracks. The Summer street side of the building is to be set back 20 feet from the line of the lot, and the space between this line and the building will be covered by a glass roof which, however, will not project over the side walk. This covered way will be carried along the principal entrance and along the full length of the main building. Upon this side it will be built over the sidewalk. The building as distinguished from the train shed is to be of brick and sandstone upon granite and with a copper covered hip roof. The first story is to be 30 ft. high. The upper three stories are to be used as offices by the different roads occupying the station and the offices of the terminal company which is to conduct the construction of the terminal, are to be in the angle of the building over the entrance.

The train shed, which will be spanned by a double arched roof, is to be 825 ft. long by 610 ft. wide, containing 33 tracks. It will be lighted and ventilated from the top through a monitor. The use of the present passenger tracks of the New England road entering from the east over Fort Point chan-

be \$5,000,000. It might be stated here that the estimated cost of the whole undertaking is about \$6,000,000. The matter now rests while awaiting the action of the legislature upon a bill presented by the mayor of the city. The following statement is taken from message of Mayor Quincy in regard to the apportionment of the expenses and the cost of work to the city.

"In order to enable the different roads concerned to join together upon a suitable basis for the acquirement of the necessary land for the new terminals and the construction of a union passenger station thereon, it is necessary to form a terminal company, to be owned by the different railroads, and to be managed by their representatives. The general basis upon which it is proposed to divide the expense is that the railroad companies, through the terminal company, shall bear all the expenses, except those occasioned by changes in streets, which are to be borne by the city. The terminal company is to acquire the title to the land along Fort Point channel, on which Federal street is to be relocated, and is to convey this land to the city free of charge, in exchange for the land within the limits of streets which is to be taken by the terminal company. The expense of constructing a retaining wall along the channel, of filling the land and of constructing the street is to be borne by the city.

"The expense of this work from Summer street extension to Federal street bridge will, according to the estimate of the city engineer, amount to about \$325,000. His estimate of the cost of widening and extending Summer street is \$625,000, and of the cost of widening and extending Cove street, allowing an outside price for the land taken, \$850,000. The whole



PROPOSED PLAN OF TRACKS AND STREETS-NEW SOUTH UNION STATION, BOSTON, MASS.

without crossing the tracks of the B. & A. Railroad, which will make it possible to eliminate the present grade crossing at Dartmouth street. The B. & A. Railroad gives up its tracks across Kneeland street and its present property between Kneeland and Beach streets. The freight business of the Providence division, together with that of other divisions of the N. Y., N. H. & H., will be transferred to the South Boston terminal of the N. Y. & N. E. Railroad, which will be enlarged if necessary. The old B. & A. passenger station will be turned over to the freight business for that road, and if necessary a portion of the space now occupied by the N. Y., N. H. & H. passenger station may also be taken for this purpose. A new station will be built on Dartmouth street and Columbus avenue at the junction of the Boston & Albany and the Providence roads. It will be a completely equipped station at which all trains on both roads will stop to discharge or take on passengers. This will be a convenient location for Back Bay and South End passengers than was the Park Square station, and will be a great convenience for patrons in the southern suburbs. This station is to be provided with means of access by carriages.

The head house of the new station at the terminal is to have four stories for a portion of the width upon Summer street and the new street upon the west side which will probably be called Cove street. The grand entrance will be at the northwest corner of the building and will be surmounted by a tower 120 ft. high in which a large clock will be placed. The principal waiting rooms, baggage and express rooms will extend along the west side upon the new street and on this side will be wide openings

nel, as indicated in the lower right hand corner of the illustration, is to be discontinued and these trains are to be brought in over a new bridge parallel with the Old Colony tracks as shown. The arrangement of tracks in the yard outside of the station seems to be open to criticism but as the plan may be changed, comments on this will be reserved for an examination of the final arrangement.

The advantages of this site are apparent to every one acquainted with Boston, and it would seem probable that if the plans as they now exist are carried out, no further improvements in facilities in handling passenger traffic will be required in that city for a great many years. The extent of the work can only be appreciated when it is stated that the station and terminal will cover about 23 acres of ground. The location of such a terminal so near the business center of the city will be a remarkable accomplishment. This station will be the largest in the world, and the advantage of the reduction of the number of separate terminals to two for the entire city can hardly at this time be fully appreciated.

If the necessary legislation is enacted, the work will be undertaken by a new corporation, called "The Boston Terminal Company," all the stock of which will be held by the railroad companies interested in the station, and its business will be managed by their representatives. This company will have entire control the terminal station, and the regulation of traffic therein. The roads using the station will pay their proportion of the fixed charges, the expense of the administration and operation according to the proportion of business carried on by each. The capital stock of the company is stated to

expense to the city, according to the figures of the city engineer, would thus amount to about \$1,800,000.

"For this expenditure the city will not only get the great benefits which will come to it indirectly by the establishment of the union passenger station—benefits which would alone in my opinion, warrant the whole expense involved—but it will get a direct return from the taxation upon the increased valuation, which will certainly run into the millions, of property taken for terminal purposes, and it will also have the great benefits of new and wider streets. The bringing of the Providence terminals north of the Dartmouth street grade crossing into the market will also result in a large increase in taxable real estate in that locality. The abolition of the grade crossing of the Boston & Providence and the Boston & Albany Railroads is of great advantage to the city, not only because it removes a constant source of danger and delay, but because it makes quicker suburban service (probably by the use of electric power) possible on both these roads. Anything which will tend as such a service will certainly do, to the more rapid building up of the large amount of vacant land lying within the city limits would be of great advantage."

A remarkable run was made on the Philadelphia, Wilmington & Baltimore Railroad March 17 by train No. 60, second section of the Congressional Express. The thirty-five miles between Baltimore and Havre de Grace were covered in 33 minutes, and the run from Perryville to Gray's Ferry, 56½ miles, in 53 minutes, including a stop at Wilmington. The time for the entire distance, 92½ miles, was 88 minutes.

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CHICAGO, SATURDAY, MAR. 28, 1896.

THE enterprise exhibited by the roads running out of Boston to the south and west in combining to erect a union station, the plans of which is outlined elsewhere in this issue is commendable, and this work if it is carried out will probably result in greater benefit to the city than is now expected. An elevated road connecting the two union stations would complete the plan and result in producing one of the best and most convenient arrangements of railroad terminals in the country.

THERE is one feature of the iron trade that purchasers of supplies of steel do not overlook, and that is that with a moderate demand of mill and furnace products, and with producing capacity idle to 30 per cent, prices remain stationary. Another point is that coke, coal, ore, pig iron and steel billets have kept their naturally high positions since the opening of the year. The accumulating tendency is now under control. Heavy requirements are in sight, but there is a lack of that rushing demand that gives a snap to business. Rail mills are badly in need of business, but it does not come. Ore vikings hold a monopoly over production. Coke is above its proper level. Coal combinations are blocking a declining tendency. The entire trade is in a healthy condition, though demand is below the stimulating point.

THE question of the advisability of railways taking up manufacturing for the sake of the saving which some hope to make of the margin of profit which is earned by the manufacturer who sells his product, has been discussed in these columns, and while it has been shown that there are cases in which such manufacturing is justified, there is a large amount of this work which is done at an absolute loss. The reason for this seems to be that what may be called business principles are not always used as a basis for the calculations and plans for the work, even where any planning is done. An instance was recently pointed out in a tool room of a road upon which better things might be expected, of a man who was making twist drills. On questioning the advisability of doing this work in such a retail manner, the officer who was in charge said that it did not matter what the drills cost as the man had nothing else to do just at that time, and in fact he had a standing order to take up such work whenever his other duties were performed. There are two criticisms to be made upon this. First, the man's work was costing the road more than the price of the drills would amount to if bought from regular manufacturers, and second there was work on hand which might have employed his time to better advantage. This instance might be taken as the subject of an argument against all manufacturing in railway shops, as it is a good example of work which is best performed by special machinery; and this applies to many mechanical processes. There seems to be no justification for such a wasteful use of a man's time. It might have required some planning to keep this man employed to good advantage, but it is possible in most shops to find a deal of work in the line of repairs to old machines, which seems to be a proper field for the employment of odd moments, and one which would produce an actual saving to the road. One thing common to nearly all departments of several roads which could be mentioned and which is costing these roads a good deal of money, is that it is thought that whatever is done by the men on the pay rolls of the company does not cost the company anything. This is a fallacy which it is believed is rapidly becoming understood and the agitation of the subject of shop costs in comparisons between the

records of different shops is likely in time to do away with it almost entirely. Such examples, however, would indicate that some officers are not yet up with the times in this respect.

THE question of interchangeable mileage tickets and incidentally of all mileage tickets, is being much discussed of late. As might have been expected, the experience of those roads who have joined in an arrangement to individually issue interchangeable mileage tickets, has not been particularly happy, and it is not strange that the inevitable reaction incident to such a procedure should extend beyond the limits of the objectionable practice. It is not easy to understand why railroads with a large mileage and heavy traffic should consent to the sale of interchangeable mileage tickets with roads of small importance and doubtful responsibility; but such appears to have been the case, and the harvest, which was not difficult to predict, has come. That, however, is no sufficient reason for disclaiming against other forms of mileage tickets, or indeed interchangeable ticket. This journal has for some years advocated a five thousand mile individual interchangeable mileage ticket to be issued by the chairmen of the respective railroad associations, and good on all roads comprised within the association. The advantages afforded by such a ticket would justify the regulations necessary to protect the roads in its issue. Inasmuch as such tickets would be used mainly by the traveling representatives of commercial houses, unused portions could be made redeemable in exchange for new tickets, so there would be no need for resorting to the scalpers' offices for protection against loss. Coupons could be made to express various mileages, and each coupon provided with a stub upon which could be noted by the conductor, the name of the road, detaching the coupon so that in case the coupon was lost the stub of the mileage book would show to what road the missing mileage was due and payable. The price of these books could be fixed at, say one hundred and five dollars, with the stipulation that the additional five dollars should be refunded upon return of the cover containing the stubs of the coupons. Some such system properly worked out would furnish a much needed convenience for traveling men and at the same time afford ample protection to the roads. It is probably true that a uniform rate of two cents per mile is not fully compensatory to the roads, but it is nevertheless practically all that can be charged under present conditions, and it is believed that the roads and the various associations would serve themselves and their patrons to good advantage by adopting some such plan as is here suggested.

IN CONNECTION with the questions concerning economical use of fuel on locomotives the matter of coal premiums has been brought up as in some cases a necessity in order to induce men to try to secure improvement in their records. Along with the advantages to be derived from this plan there may also be some disadvantages, such as are brought out in the letter from a locomotive runner who signed the communication to *Engineering* from which the following quotation is made: "I wish they would do away with the coal premium, for it only makes men rogues and swindlers, and all drivers and firemen hate it. Do not for a minute think that I have the premium because I do not get it; I always do get it, and have done for years. But what good is it to me? I have to pay just about as much as it is worth; I have to give out of it tips to the guards, who do not put down lost time to me when I drop a minute or two, and I have got to tip the fitter that keeps my engine in order, and I have got to tip the coal-stage men, who let me have a six cwt. box of coal now and again for nothing. There is a tip to the stores man for letting me have oil and tallow and not putting it down to me. There are two or three of the tips you have to give, and for all this tipping I get about ten shillings premium a month. I burn about thirty-two pounds of coal a mile, so the coal sheet says; the other men burn thirty-two and one-quarter pounds, thirty-two and three-quarters pounds, thirty-four pounds, and one burns thirty-seven pounds. Of course the first four are coal dodgers, but the work we do burns quite forty pounds a mile; we all know it, and our foreman must know it. It will never do for me to begin to be honest, and put down the coal I burn. If I did, I should have to go the bottom of the coal list, should be called on the carpet before my district superintendent, and get put back on to a shunting engine or perhaps discharged. Being fifty-five years of age—thirty years a driver, twenty-five years on express trains—and a man with a wife and six children, you can see this would ruin me, so I shall be obliged, until they stop this humbugging system, to continue to

be a downright old coal dodger." The last three words are supposed to be the signature. While these sentiments possibly reflect an actual condition, and one that might possibly exist to a certain extent wherever the premium system is in use, this statement indicates that there must be a screw loose, and probably a whole box of them, somewhere in the system in operation on the London & North-Western Railway for keeping track of the fuel used by each locomotive. The temptation must be expected to exist whereby some men may seek to obtain a better rating than that to which they are entitled, but it seems easy to guard against gross dishonesty. This is one of the matters to be considered in getting up a premium system, but one which is not difficult to provide for, and it does not follow that because care must be taken to prevent cheating that the premium system is wrong.

HIGH LOCOMOTIVE BOILERS.

The increased height of a number of the passenger locomotives which have been turned out during the past few years, has brought up the question of the effect of the increase in the height of the center of gravity upon the riding of the engine, upon the maintenance of track and also as influencing the danger of derailment. It is impossible to isolate the effects of the increase in the weight and size of locomotives into the elements referred to in such a manner as to enable them to be considered distinctly and individually, yet it may be stated that the large engines have not as a rule proved to be destructive or in fact more severe upon the track and structures than were those which were designed a number of years ago.

Mr. P. H. Dudley has shown conclusively that the wear produced upon the rails by the heavy engines running upon the New York Central Railroad has diminished rather than increased since 1883, when the weights upon drivers were but thirteen thousand three hundred and sixty pounds each. The results of his observations cover a period of over twenty years and were published in the *RAILWAY REVIEW* of March 14, 1896. The figures given show that in 1883 with driving wheel loads of thirteen thousand three hundred and sixty pounds, and sixty-five pound rails, the wear of tires amounted to one sixteenth of an inch for nineteen thousand four hundred miles run by each locomotive. In 1891 the passenger locomotives on the Hudson division made their entire mileage upon eighty pound rails, and with twenty thousand pounds per driver the mileage was nineteen thousand four hundred for the wear of one-sixteenth of an inch of the tires. Again in 1895 the record of forty-three locomotives showed a mileage of twenty-three thousand one hundred and sixty-six, for a loss of one-sixteenth inch on eighty pound rails and with twenty thousand pounds per driver. The most remarkable figure, however, was given for the locomotives which ran partly on eighty pound and partly on one hundred pound rails. Twenty three of these made an average of twenty-nine thousand forty-six miles per one-sixteenth inch wear, and if these engines were run entirely on the one hundred pound rail this figure would probably be exceeded. The wear upon the rails themselves is not stated, but it seems fair to consider that this would be measured by the tire wear. At all events if the influence of the increased weights upon the track was bad it would be reflected in the condition of the tires.

Allowing for the improvements which have been made by widening the rail heads and also in the improvement in quality of driving wheel tires, this showing is a remarkable one and indicates that the increase in wheel weights is not attended by serious results, but entirely the contrary. The increase in the weights has been accompanied by, and has also been a direct result of increasing the boiler power of locomotives, which is to be considered the greatest advance in designing which has been made in the period mentioned. The employment of traction increasers is no longer necessary, and the only question which has been raised is in regard to the possible top heaviness of the large engines. This question was asked thirty years ago and according to Stretton was answered then by Mr. J. E. McConnell, who laid aside the theory that lead to efforts to obtain large driving wheels and yet keep the center of gravity down as low as possible. He disagreed most strongly with the low boiler theory and maintained that there was no objection to a high boiler. He was ridiculed at the time, but now it is seen that he was only about thirty years ahead of the times.

The recent large locomotives certainly ride well, and while smooth riding and absence of damage to tracks do not necessarily accompany each other, it is certain that raising the center of gravity has not produced bad results in either of these directions. The

large mass of a heavy locomotive does not act as quickly upon receiving shocks from uneven track as does a lighter one, and inequalities in the track which would cause a light locomotive to roll are passed almost unnoticed by the heavier one. It is pointed out elsewhere in this issue that a locomotive is like a ship as regards stability. The more stable the ship the harder the motion, and the less the stability the easier will be the roll. It seems reasonable to expect that, with a locomotive, as the line which joins the center of gravity to the rail makes a more acute angle to the horizontal, or in other words, as the center of gravity is lowered the greater will be the jerk or thrust upon the rail, which will be transmitted by the flanges. But if the center of gravity is raised the thrust will become more nearly vertical and will be transmitted to the rail through the medium of the springs. It is also of interest to consider that the center of gravity of the entire locomotive is raised but about twenty-five per cent of the distance through which the center of gravity of the boiler may be raised by increasing its size within reasonable limits. It is not believed that the limits of safety have been reached in raising locomotive boilers, and it may be confidently expected that this matter may be carried as far as the limits of clearance will permit before danger of real topheaviness is incurred.

PRESENT STATUS OF THE INTERSTATE COMMERCE LAW.

The decision of the United States supreme court in the case of the United States vs. Brown to which reference was made in our issue of March 7 has been published. The law under which action was brought deals directly with the act to regulate commerce, but some lawyers affect to believe that the decision will have much wider scope and be applicable to all cases where criminal liability is present; some going even so far as to state that advantage will be taken by criminals to reveal their wrong-doings when brought to trial, for the purpose of claiming immunity thereunder. So devious are the ways of lawyers and so peculiar are the rulings of some courts that a layman may not venture to predict to what extent this late ruling of the United States supreme court may be thus employed. If a freeness of expression corresponding in degree to the reticence manifested by those heretofore called upon to testify shall be exhibited by those accused of violation of law, it is possible that there will be some ground for such a claim; but if common sense and common honesty is permitted to dictate, there is no need for serious apprehension on that score.

□As is usual in such cases, the press of the country has indulged itself in all manner of unwarranted utterances concerning the effect of the decision. "Nothing more is wanted to make the interstate commerce law a success;" "the paying of rebates effectually abolished;" "The Interstate Commerce Commission clothed with autocratic power;" "No farther chance for discrimination," etc., etc., have been the prevailing headline comments, as though the interstate law was now fully sustained, and nothing more was needed to enable it to serve the purpose for which it was instituted. These comments are in line with those heretofore so much in evidence as to the uselessness of the law, because of the want of power now established to compel testimony, and which arise from an utterly inadequate conception of the scope of the act. Such a conception proceeds upon the theory that the Interstate Commerce Commission is mainly, if not wholly, a detective and prosecuting agency. It loses sight of the regulative powers of that body which is its superior function, and which more than any other justifies its creation and continuance. The decision of the court in question is chiefly important, not because it will permit the getting of evidence sufficient to convict the violators of the law, as that the recognition by the court of the necessity for governmental supervision, and the disposition of the court to sustain the law, will establish in the minds of those to whom it chiefly relates as something not lightly to be regarded.

The act to regulate commerce has passed through two stages of existence, and may now be said to be entering upon a third. At the first it was an unknown quantity. The railroads, although not unanimous in their estimate of the law, nor disposed to regard it with much favor, nevertheless, uniformly fell into line with its requirements. So general was this compliance that the sixth day of April, 1887, when the law took effect, saw a complete revolution in the matter of traffic arrangements, wholly due to its influence. For several months, this conformity to the law was maintained, but gradually as its pro-

visions came to be better understood and its inherent defects became manifest, a second stage, that of evasion, was entered upon. The requirements of the law were largely ignored; sometimes of choice, but oftener because the conditions imposed by the law, made it impossible to accomplish the results sought after in the law. In many cases the primal law of self-preservation was set over against that of statutory regulation, and the roads found themselves much in the same position as the poor man who is obliged to steal or starve to death.

The third stage upon which the law may now be said to be entering promises better things. Particularly will this be the case if the various weaknesses of the present act shall be overcome by the various amendments recommended to congress by the Interstate Commerce Commission. It is difficult to understand why the amendments so recommended do not receive immediate consideration. The necessity for the changes proposed is self-evident to say nothing of the weight which should attach to them by reason of the standing of the body from whom they proceed. These gentlemen have made a careful study of the law for some years and their views are entitled to consideration. It is, perhaps, too much to expect that politics can be entirely kept out of the question, but there ought to be enough men in the congress of the United States sufficiently broad minded, and sufficiently patriotic to do that which is admittedly for the best interests for all concerned.

LARGE FREIGHT CARS.

The problem arising from the present minimum weights for bulky freight, received special attention by the New York Railroad Club at its last meeting when an elaborate and exhaustive report was presented by a committee and discussed by the members. In addition to the report a number of appendices give the opinions of officers from various railway departments upon the question. The presentation of the subject occupies seventy-three pages of the proceedings, and it may well be said that the question has been thoroughly aired. There is little doubt, however, that the mechanical departments of the roads have nothing whatever to do with the problem except to build the cars when ordered to do so, and that the blame for the whole thing rests upon the traffic department and is born from a desire of the roads to overreach each other. There are no insurmountable difficulties in the mechanical construction of large cars but they are awkward, ungainly and without doubt will prove to be far from as serviceable as the best of the smaller cars. They are objectionable on this score, and also because of the limited clearances of some roads and the dangers to which trainmen are subjected in handling them. They are nuisances in every department and no sufficient reason can be assigned for their existence. The tonnage carried per car has increased with the increase of capacity of cars since 1876, and if this improvement could be expected to follow further increase of capacity the problem would lose one of its bad features. This, however, is not to be expected and the present commonly accepted standard of sixty thousand pounds capacity seems to be about right and fully large enough for ordinary demands. This size of car has shown itself to be well adapted to the conditions of traffic in this country and mechanically it is all that is desired.

The reasons for the demands which have been made for large cars were set forth in the RAILWAY REVIEW of May 18 and December 21 of last year, on pages 275 and 709. Nothing new has been advanced in this direction except that the committee of the New York Railroad Club has emphasized the general undesirability of the cars, which are "as big as a house," from the standpoints of every department having to do with them, not accepting the traffic department, which is responsible for the present state of affairs. A disregard of the interests of the roads as a whole is apparent here. The nail was struck upon the head by Mr. A. C. Bird, general traffic manager of the Chicago, Milwaukee & St. Paul Railway, in his communication to the committee, which begins with the following paragraph: "I believe that the problem of large cars has arisen because traffic officers have not kept sufficiently in touch with the transportation feature of the question, and the necessity for a reduction in the cost of operation, which the constant downward tendency of rates makes imperative. There is hardly room for doubt that the net profits which go to the stockholders are nothing more than the aggregate of minute economies that result from modern improvements. If this is not wholly so to-day, it will be in the near future." To increase the carrying capacity of cars without an at-

tendant increase in weight, is a legitimate and proper field for improvement, and one in which the interests of the road are served, and yet without imposing any hardship upon any department. Much attention has been given to this subject, and it is probable that what might be termed the efficiency of freight cars will be greatly improved over present practice, as a result of these discussions.

At this time nothing need be added to what has already been suggested in the previous issues of this journal, mentioned, as to a remedy. Rate schedules must be so arranged that a small car will be as much in demand by shippers as a large one, and it seems altogether likely that something will be accomplished along this line in the near future by legislation. The conclusion of the New York Club after the discussion of this question, was expressed in the following resolution which was passed: "Resolved, That it is the sense of the New York Railroad Club, on the question of large capacity cars for general interchange service, that box and stock cars shall not be built to exceed a capacity of sixty thousand pounds, and that this club earnestly recommends to the traffic associations that in making their rates on light bulky freight, such rates shall be based on the cubic capacity of the car." Something further will be said upon the proposals for a solution of the matter later, but without considering this part of the recommendation now, the part referring to the maximum capacity for cars in general interchange service is a step in the right direction, and it will doubtless assist in calling further attention to the objectionable features of the present system. The committee presented some suggestions with regard to sizes of cars which would make them available for use in general interchange traffic. It is also suggested that all four wheeled cars, and also eight wheeled cars of less than forty thousand pounds should be withdrawn from interchange traffic, and that the limit of minimum allowable length for this traffic should be placed at thirty feet, the storage capacity being limited to fifteen hundred cubic feet. This, however, would require a rule in the interchange code which would certainly work a hardship upon some roads and without gaining a corresponding advantage.

The committee takes up the question of construction of cars and with reference to those of 70,000 lbs. capacity recommends the use of six truss rods of one and one-half inches diameter and the setting of the queen posts so as to bisect the angles of the rods at the cross tie timbers; also the sills should not be less than five by nine inches. The guess work practice of designing is pointed out by showing that sills for cars of the same nominal capacity vary from four by eight inches in section to five by fourteen inches, and truss rods vary from four of one inch diameter to six of one and one-half inch diameter. It is also stated as the opinion of the committee that the truss rods should be proportioned to hold up all of the static load, and that the framing of the car should be relied upon to withstand the extra stresses placed upon the car while running. The designs of bolsters and of trucks are given a properly important amount of attention, and the fact that truck design and construction has far outstripped the other members of a car, is appropriately mentioned. For this, however, the proper credit is not given by the committee to the designers who are working entirely outside of the ranks of railway men, and who have done the roads great service in this particular. The committee recommends an improvement in the design of diamond trucks by reducing the diameter of the column bolts, and by supplying additional strength at these points by the use of U-bolts. They might also to good advantage have suggested the use of large radii in bending the arch bars, such as were employed by Mr. Waitt in the car illustrated in the RAILWAY REVIEW of March 7, 1896, p. 129. Another important item in the design of large cars is that the most efficient braking percentage is seventy, and as this must be reckoned from the light weight of the car, the efficiency of the brakes diminishes with the increase of load in each car.

The conclusion of the report sums up the constructive features of the question by recommending that the maximum capacity of roofed cars be fixed at 70,000 pounds and that of open cars at 80,000 pounds, which should not be exceeded except by mutual agreement. It is noticeable that the committee has not gone into the question of cars built with a view of handling very different classes of freight, except as to the features of the question in which weight enters. This would have strengthened the position taken with reference to the undesirability of large cars from a traffic point of view, but perhaps enough had already been said upon this subject.

CONVENTION OF THE GENERAL PASSENGER AGENTS' ASSOCIATION.

The meeting of this association which was held at Richmond, Va., March 17 was called to order at 11:30 a. m. by Mr. D. J. Flanders, president. The chairman directed a call of the roll, after which the secretary announced that a quorum was present.

Favorable action was taken by the executive committee on the credentials of new members, the chairman, Mr. Stone, reporting in accordance with that fact.

The next order of business was the selection of a place for holding the forty-first semi-annual convention. Lookout Inn, Lookout Mountain, Tenn., and Atlantic City, N. J., were placed in nomination. The last named place receiving a large majority of all the votes cast, was by proper action unanimously selected. The date of the meeting is September 15; the hour, 11 o'clock a. m.

Mr. Atmore, chairman of the committee on safety paper, reported progress, explaining that very much original work has been done by paper manufacturers and printers, and that the committee might be able to make a final report at the September meeting. They were by proper action granted further time. The committee on paper contracts not having a report to present, action on that question was postponed.

The secretary reported that Mr. C. G. Phillips, secretary of the Association of American Railway Accounting Officers, had expressed a willingness to supply our members with a copy of a "Synopsis of the Decisions and Recommendations" of their association. By proper action, the secretary of the association was instructed to arrange with Mr. Phillips to have them so supplied.

The secretary was instructed to advise Mr. J. D. Prince, of the transportation department of the exposition of the City of Mexico, that the arrangements for business to that point and for advertising the matter, was a question to be handled by the lines individually.

Messrs. Martin and Buchanan addressed the association on the question of its re-organization; and, notice being given that suggestions to that end would be presented at the next meeting, a motion was made and adopted that a committee of five be appointed by the chair, to recommend changes in the constitution and by-laws to report at the September meeting. The chair subsequently announced as the committee—Messrs. Martin, Daniels, Ford, Turk and Stone.

Mr. E. J. Richards, of the New York Central & Hudson River Railroad, sent a communication suggesting some action toward uniform practices in cancelling inter-line tickets. By resolution properly acted upon, the chair appointed a committee of three to report upon this matter at the next meeting. The committee is Messrs. Buchanan, Danley and Kendall.

The following was then adopted:

Resolved, That a committee of three be appointed to recommend a uniform method of action upon applications for ticket representation.

The chair appointed as that committee Messrs. DeHaven, Lee and Fellows. The committee was instructed to report at the next meeting.

The chair here appointed the following committee to report the name of some member as orator for the next meeting: Messrs. DeHaven, Hall and O. Taylor. They almost immediately reported the name of Mr. E. A. Ford, G. P. A. Pennsylvania Company's lines, and he was unanimously elected.

Mr. Atmore suggested as an important subject for renewed action at the next meeting, the question of uniform contracts on inter-line tickets, and as the association had not had them carefully revised for several years, unanimous consent was given to the appointment of a committee of five to report on the above subject at the next meeting. The chair subsequently announced that committee as follows: Messrs. Stone, Armstrong, Carrel and Baldwin.

The following was offered, seconded and carried:

Resolved, That it is the sense of this association that the continued use of unlimited tickets, either local or inter-line, is prejudicial to the interests of the railways here represented, and that we recommend to the different passenger associations throughout the territory that immediate steps be taken to have the same withdrawn, and that a committee consisting of one member of each association be appointed to further the adoption of this resolution by each association.

Interesting remarks on the above were made by Messrs. Martin and Buchanan.

At the adjourned meeting held at 10 a. m., March 18, the chair announced as the committee above provided for: Mr. D. McNichol for the New England Association, Mr. D. I. Roberts for the Trunk Line Association, Mr. C. S. Crane for the Central Passenger Association, Mr. C. P. Atmore for the Southern Association, Mr. J. R. Buchanan for the Western States Association, Mr. S. K. Hooper for the Trans-Continental Association.

A resolution was then adopted that hereafter the secretary should send a circular to each member 60 days before any meeting, requesting them to forward to him topics for discussion at the next meeting; that he should tabulate these and furnish each member a list of same, with the call for the meeting, at least 30 days before the actual date of the meeting.

The next order of business was the election of offi-

cers. Mr. C. L. Stone, chairman executive committee, in the chair. Mr. Dana J. Flanders, general passenger agent Boston & Maine Railroad, being the only nominee for president, the secretary was instructed to cast the vote of the association for that gentleman for president, which was done. Mr. W. A. Turk, general passenger agent Southern Railway, was the only nominee for vice president, and the secretary was authorized to cast the vote of the association for that gentleman for that office, and that was also done. The president cast the vote of the association in favor of the present secretary for that position for another year.

The chair, later, announced the following as members of the executive committee: Messrs. Sebastian, Scull and Hall.

The following resolutions were unanimously adopted:

Resolved, That the thanks of the association are hereby tendered to Messrs. Ainslie & Webster, managers of the magnificent Hotel Jefferson, for their courteous attention during our stay with them.

Resolved, That the special thanks of this association are due and are hereby extended to the representatives of all the terminal lines at Richmond, to the Transfer Company, to the Virginia Navigation Company, to the Richmond Chamber of Commerce, to Commandant Colonel Charles P. Bigger, of Lee Camp Soldiers' Home, to the members of the Commonwealth and Westmoreland Clubs, and for all others connected in any way with our entertainment during our sojourn in their beautiful city;

Resolved further, That we are under special obligations to Mr. C. A. Taylor for his constant and continued attentions.

A communication was here read from Mr. B. W. Wrenn, the orator for this meeting, explaining his unavoidable absence in Jamaica, and requesting the secretary to read his address. The president detailed Mr. D. B. Martin for that duty.

Adjourned until 10 o'clock a. m., March 18.

Called to order at 10 o'clock a. m., President Flanders in the chair, who announced the several committees previously authorized, and which appear in their proper places in this report; after which Mr. Martin read the address of Mr. B. W. Wrenn.

After the reading the following was adopted:

Resolved, That the thanks of the association be tendered to Mr. Wrenn for his very able address, and to Mr. Martin for the specially interesting way in which it was delivered.

The chair here allowed a brief statement to be made by a committee of gentlemen representing Atlantic City, N. J., our next place of meeting; after which, on motion, the convention adjourned.

Tests by the Slide Valve Committee of the Master Mechanics' Association.

The locomotive laboratory at Purdue University has been given over during the past few days to the slide valve committee of the Master Mechanics' Association. Tests have been conducted to determine the power necessary to move balanced and unbalanced valves. The work has been carried on by Mr. G. R. Henderson, chairman of the committee and Mr. L. R. Pomeroy member of the committee, assisted by the regular corps of laboratory attendants. Mr. H. C. Hammett of the Richardson Slide Valve Co., and Mr. J. T. Wilson of the American Balance Slide Valve Co., have been present; also Mr. F. W. Thomas, engineer of tests, Norfolk & Western Railway, and Mr. Angus Sinclair, secretary of the Master Mechanics' Association.

THE PROFITS OF UNITED STATES AND ENGLISH RAILWAYS COMPARED.

To the thousand and one bondholders who have experienced the disappointment of having their coupons returned, a treatise on the profits on the working of United States railways might recall the story about snakes in Iceland. It would be difficult to convince the British mind that there was profit, in view of the fact that American railway shares are now largely dealt in purely for speculation, as a mild imitation of the performances in the mining market, and especially in the "Kafir Circus." It is long since investors regarded American railway stock as a safe security; and Poor's Manual, that comprehensive record of railway working, the 28th annual volume of which has recently been issued, throws some light on the causes which have led to the present uncertainty in its value. Over competition is generally attributed as the cause, and that it exists few will gainsay, for the effect of strong competition is seen in low rates and corresponding poor return to capital. Competition is of much advantage to the country; but the interests of the shareholder cannot be ignored. In this country we have relatively high rates, affording in consequence a higher profit, so that the railway shareholder gets a good return at the expense of the trader, while in the States the opposite is the case. From the national point of view the latter is preferable, since the encouragement to trade generally is very direct, provided that capital is not frightened out of railway undertakings. No one objects to legitimate pioneer lines, and some excuse must ever be made for error in foreseeing the direction that commerce will ultimately take; but there are some lines in the States for the existence of which there is no excuse, because they are duplicate roads situated in districts where the benefits of competition were already provided.

Some lines have too many issues of bonds, and this has fostered the suspicion that they were promoted for the mere sake of securing profit on construction. But re-

cently it has not been so easy to raise capital, and the additions to mileage have been on a more moderate scale. Eight and twelve years ago the average annual increase was from five to seven times greater than it has been for two or three years past. Now the total mileage is 180,000, and the probabilities are that in view of the low dividends, the additions each year will be less, for the lowness of the return on existing lines is more operative on the public mind than sanguine estimates of probable gain from new lines. It is true that there is only one mile of railway to 20 square miles of area, whereas in Britain we have one to 5.8 square miles. But this standard of comparison, so often adopted, is misleading. It were better to consider population and trade. In Britain there are 1,846 inhabitants per mile, and in the states barely 350, while the value of foreign trade, imports and exports, works out to over £30,000 per mile of railway in Britain, and to £1,900 per mile in the states. Of course the consumption of home products is an element in the consideration, but it must be remembered that the population of the United States is not double that of the United Kingdom, while the railway mileage is nearly nine times.

The railway results themselves seem to show benefit to the trader rather than the shareholder, no matter from what standpoint these are examined. The interest paid on stock last year was 1.64 per cent—ten years ago it was 2¾ per cent—whereas in this country the return on ordinary capital is equal to 3¼ per cent. The United States is not by any means so compact a country, as this, but at the same time, it should be remembered that this reason makes our roads the more expensive, so that the average capital per mile in this country is nearly five times as great as in the United States. In other words, each mile in this country must show a net profit five times as great as in the United States to pay the same dividend. As a matter of fact, each mile in this country earns in net profit nearly 1,800%, against 362% in the United States. But the difference in the gross earnings per mile open is not so great, being in the United States 1,217%, while in this country it is 4,000%, so that it will be recognized that our system is worked more successfully. In other words, 43 per cent of our total receipts is profit; in the states barely 30 per cent is thus retained.

It may be interesting to compare some statistics of traffic with the view of ascertaining the reasons for this marked difference. Of course the conditions differ and affect the results so much that probably the same results cannot be attained in the states; our freight rates admit of a larger surplus of profit. But the comparison may nevertheless suggest some means whereby a better return may be obtained than at present, even with the low rate obtaining in the states. In the first place, the nature of the traffic differs. In the states 26 per cent only of the revenue is from passengers, against 46 per cent in this country, so that the charges for the handling of the greater volume of goods traffic accounts in some measure for the greater expenditure percentage of traffic receipts. It is not possible to arrive at any result as to relative fares per mile. Our railways refuse to supply passenger mileage and ton mileage. But it is somewhat interesting to note that although the total length of railroad in the states is 8½ times that in this country, the passenger train mileage is not double. In other words, each mile of railway in this country is on the average traversed 8,600 times in the year by passenger trains; while in the states it is only covered about 1,900 times. This is, of course, due to the number of passenger trains in the far west seldom exceeding four per day; and in many cases a passenger car is only attached to the freight trains, so that it will be at once apparent that British conditions cannot obtain.

The average fare per mile does not differ very much, but is rather less in the United States. There it is 1d (2.03 cents) per mile, but in the more important districts ¾d only. In this country the third-class passenger predominates to such an extent as almost to make the extra charge on first and second class passengers inoperative in effect, so that it may be taken that the rates are about the same. The average distance traveled in the States is 24 miles; in the eastern and more closely populated states it is considerably less. The preponderance of suburban traffic in this country involves a lower average distance traveled, but it cannot be positively arrived at from the Board of Trade report. The receipts per passenger train mile in the States are 3s. 6d.; in Britain, 4s. As the fares do not differ materially, the number of passenger miles per train mile is approximately in the same proportion; in the States the number is 42. Where the difference in the profits of passenger traffic comes in is in the relatively fewer number of passengers per mile of railway open. In the States there were 3,324 passengers for each mile of railway; in this country, without considering season ticket holders' journeys, the number is over 43,000. It is therefore evident that there is not one-tenth the volume of passenger traffic per mile of line in America as in Britain. But as we have already indicated, the United States could not have been developed without the promotion of railways in advance of the traffic, and if this has been done to too great an extent it is a fault which will remedy itself sooner or later, provided always that heed is not paid to mere competition, instead of the development of railways along the probable lines of commerce.

A comparison of goods traffic involves greater difficulty, owing to the extremely varied conditions. We have incidentally mentioned the greater preponderance of goods traffic in the states, where nearly three-fourths of the revenue is from this source, against only about 54 per cent here. But, withal, our goods traffic receipts per mile of road is enormously greater—2,380% against 800%. Again, our volume of goods traffic per mile of road is greater, being 15,500 tons, against 3,848 tons in the states. It will be recognized that the difference is greater in volume than in receipts, indicating that in the United Kingdom the revenue is less per unit of volume than in the states. The fact that the average haul of each unit of volume is much greater in the States than here more than accounts for this. Our freight train mileage per mile of road is 7,150, against 2,700 miles in the states, but our total excludes mixed trains, which are ranked separately in the Board of Trade return. In other words, considered per mile of road Britain runs three times the number of trains for four

times the volume of traffic, and receives less than three times the gross revenue for goods. The average rate is notoriously higher, the haul is very much shorter. Quite two-thirds of the volume of our traffic is coal, the lowest rate for which is $\frac{1}{4}$ d. per ton per mile; but we have 90,000,000 tons paying much higher rates, and even were the mean of this general merchandise only 1d. per mile per ton it would mean that we have nearly 50 per cent more per ton per mile than in the states. The average receipts per ton per train mile in the states are .425d., and the average length of haul 121.89 miles. The latter in this country is far less. The receipts per goods train mile are 73.62d.; in Britain, excluding mixed trains, 70d. Each United States train mile represents 173 ton miles at .42d. per ton. Similar figures are not given in the Board of Trade return. But it is very evident that the rates in the United States are much lower, so that the railways have to undertake heavier duty to make the gross revenue per train mile the same.

Including all revenue and all train mileage, the receipts per train mile are in the United States 5s. $5\frac{1}{4}$ d., in the United Kingdom 4s. $9\frac{1}{2}$ d.—a difference of $7\frac{1}{4}$ d. per train mile. But this involves heavier duty in the United States in greater proportion than is indicated by the receipts, not only for the locomotives, but more especially in terminal charges, notwithstanding the long haul. And this in some measure accounts for the fact that in the states 70.24 per cent of the revenue is absorbed in expenses. This is some 10 per cent higher than in any of our Australian colonies, where the conditions are as unfavorable as in the states. In Britain, where legislation adds many costly conditions, the percentage has never exceeded 57. The result is that instead of getting a net profit per train mile of 2s. 1., the United States railways only obtain 1s. $7\frac{1}{2}$ d. In other words, it costs them 1s. more for each mile run by a train.

Of course, pioneer lines must be made, and these must necessarily involve loss for some years; but if we take New England or the middle states, including New York and Pennsylvania, where the conditions approximate more closely to those obtaining in Britain, we find the ratio of expenses to earnings is 74.15 per cent. in New England, and 68.37 per cent in the middle states. The average haul is much less than the mean for the whole of the states, 78 and 92 miles respectively, against 121 miles, but the earnings are, per goods train mile, 6s. 6d. and 6s. 4d., against 6s. 1d., so that here the low freight rate and heavy costs are almost as operative as in the whole of the United States, and therefore it is to be assumed that this reason, more than the paucity of traffic, accounts for the low rate of profit. The passenger train mileage in New England is above the average in the States, 4s. 7d. against 3s. 6d. for the whole states. In the middle states, also, it is 3s. 6d. Although the outlying states may have little traffic, it seems that by charging a higher rate, they gain a fair revenue. Competition has not run to excess with them. Moreover, in the Pacific and the Gulf and Mississippi states, only 64 to 68 per cent of revenue is absorbed in expenses, but the return to share capital is very low.

The railways in New England manage to return, on an average, 4.9 per cent on the total share capital, notwithstanding that they need 74.15 per cent of earnings to meet expenses, but the middle and central northern states only return $2\frac{1}{2}$ per cent, requiring 68 to 71 per cent of revenue for expenses. Their average goods rate, $\frac{3}{4}$ d. per ton mile, is very low, and must encourage trade; but such encouragement is not the object of the railway shareholder has in view in laying out his money. Competition has its advantages; we in this country have profited from it immensely from every point of view; but a line has never been projected in this country for competition only, as is often the case in the states. Parliament demands proof that the route to be traversed is in need of railway communication. Not so in all the states, or the duplicate lines along the Hudson, for instance, would never have been constructed. With a strong rates commission a monopoly cannot be effectively established.

Texas, which is not always the most advanced in civilized ways, has followed the advice long urged in several states. A railroad commission, with unusual powers, has been organized, through the legislative exertion of ex-Gov. J. S. Hogg, and the annual report before us is interesting. Their ruling as to rates has been affirmed by the supreme court; but the chief point in this connection is their function in reference to the promotion of lines and the issue of bonds. Railway companies have a happy way of meeting liabilities by the issue of bonds in excess of the worth of their property, and one duty of the commission is to value the property and franchises, and thus determine the maximum amount of bonds that may be issued. The estimate is based on the cost of construction plus a reasonable profit to constructors. Thus 6,000 miles or so have already been valued, and the average worth is 3,185 $\frac{1}{2}$ per mile, beyond which the property can not be bonded. With this restriction there is a greater chance of profit to the share or bondholders. Again, the commission has power over new railways. The route proposed is considered in the light of probable traffic, and is laid out also to involve the least difficulties. It is suggested that otherwise the interested promoter and constructor would map out the most difficult route, so that his profit on construction might be the greater. Bonds for new lines in Texas can only be authorized on the basis of the cost of constructing the road of a certain grade, with a certain kind of material, and of a certain standard of excellence to insure the minimum expense of working. The new legislation has been opposed on the plea that the effect is to discourage the construction of railways and the investment of capital in this class of security. But, as a matter of fact, the legislation, which has been in force for four years, tends to encourage investment, as it insures the carrying forward of lines which have a prospect of traffic and at a fair cost for construction, discouraging speculative lines such as we have incidentally referred to. Moreover, it insures very reasonable rates of freight. It is the guarantee which is given by this legislation that is necessary to reassure the investing public in all the states railways.—[Engineering.

Discontented passengers on railway trains should try South Africa. In the Transvaal a traveler who, at Kaapmuiders, asked a railway official to direct him to a train for Barberton was shown into the down Delagoa train, and at Hectorspruit was fined an

amount equal to five dollars for traveling to a place other than that mentioned on his ticket. Next day he went back to Kaapmuiders, inquired of another official, and found the right train. But at Barberton the authorities promptly fined him the same amount for traveling with a ticket of a previous day.

Timber Tests.

To the Editor of the Railway Review:

In a letter from Mr. B. E. Fernow, chief of the division of forestry, agricultural department, to Mr. Walter G. Berg, principal assistant engineer, Lehigh Valley Railroad, published in your issue of the 14th inst., I regret to notice that there is a strong probability that timber tests that have been so ably conducted by Mr. Fernow will shortly be discontinued for lack of the necessary funds to complete the work.

This should not be permitted, and strong protest should be made against it. The data obtained from these tests by the division of forestry, is very valuable, and every man who rides on a railroad train is interested, as a better understanding of the characteristics of the timber used in bridge and trestle construction, will enable engineers to build and maintain better structures, and thereby reduce the loss of life and property.

If every engineer in the United States will request his senator to favor the bill (S1,214) making special appropriations for the continuance of the tests, and the publication of the data obtained from them, and all engineering and railroad papers and magazines will keep the ball rolling, the bill will pass. Let every man put his shoulder to the wheel, all move together, and the good work can be accomplished.

JULIEN A. HALL.

Morotock, Va., March 18.

Engineers' Club of St. Louis.

A regular meeting of the Engineers' Club of St. Louis was held on the evening of March 18. The executive committee reported the doings of its 211th meeting, recommending that the club endorse the action of the president in writing to certain members of congress, urging that the civil engineering profession be represented on the commission on public architecture, under bill No. 1470, now being considered. On motion of Mr. Russell the club ratified the action of the president.

Mr. Arthur Winslow read a paper on "The Testing of Coals," being a consideration of the methods and objects involved in determining the properties and relative values of different coals for various uses, with special references to a series of investigations now in progress by the author. He classified the most important uses of coal as follows: First, steam making; second, coking; third, domestic fires; fourth, gas making; fifth, forge and blacksmith work.

Mr. Winslow's plans contemplate the investigation of all the standard coals of this country, with a view of determining their relative values for the above uses. The methods he proposes to adopt are as follows: first, inspection at the mines; second, collection of samples; third, proximate analyses; fourth, calorific determinations; fifth, laboratory tests; sixth, study of the coal in actual service.

Further investigations in other and special directions will be undertaken as the work develops and necessity demands. Work in the field has already begun, and the investigation will probably extend over a number of years. The author expects to make progress reports from time to time as portions of the work are completed, and he will probably collect all the results in a single publication when the work is completed.

Discussion followed by Messrs. Moore, Meier, Kinealy, Leighton, Bryan, Flad and Russell. The value of calorimeter tests was discussed, as well as the various methods of making such tests.

President Ockerson gave the results of some capacity tests on the new United States dredging boat Beta, now operating near Memphis.

Col. Meier explained a bill now before congress looking to improving the standing of naval engineers, and asked the members present to join him in signing a petition to St. Louis congressmen, commending the subject to their favorable consideration.

Locomotive Fuel and Water Supply.

The following list of questions has just been received from Mr. W. O. Thompson, secretary of the Traveling Engineers' Association, which has been sent out to members of that organization for the purpose of securing information for a discussion of the subject of locomotive fuel and water supply, to be held at the next annual meeting:

FUEL SUPPLY.

1. Under the supervision of what official of your road is the locomotive fuel supply?
2. Assuming that your fuel supply is drawn from varying sources, and that it is consequently of a varying quality, what effort is made to localize these variations? Or in other words, do those controlling the fuel supply aim to keep it as near uniform as possible on a given district or division?
3. Has a systematic method been adopted on your road of districting the fuel supply? If so, please state fully plans employed and results obtained.
4. What in your judgment would be the advantage gained by districting the fuel supply, with the view of keeping it uniform in same territory?
5. Do you consider that it would tend to economy and

improved service if your fuel supply was under the supervision of your mechanical department chief?

6. If fuel supply is handled by transportation department, do you think your mechanical department chief should be consulted with reference to quality of coal furnished?

7. Is the head of your mechanical department consulted with reference to any proposed changes in fuel?

WATER SUPPLY.

1. What department of your road is charged with the control and maintenance of the water service?

Do you consider that it would result in economy and improved service if the furnishing of water for locomotive use come under the direction and control of the mechanical department chief of your road?

3. Is the head of your mechanical department consulted with reference to quality of water furnished?

4. Does your road have feed water analyzed?

5. What is the life of flues in your best and worst feed water, and what methods have been employed to overcome effects of bad water? This report was continued from last year and the committee would be pleased to receive any additional information over and above the foregoing questions that the members may offer.

All communications should be addressed to W. R. Scott, chairman of committee, 505 E. 2nd street, Newton, Kan.

Western Society of Engineers.

The next regular meeting of the Western Society of Engineers will be held in the society's rooms, 1737 Monadnock Block, Wednesday, April 1, 1896, at 8 p. m.

A paper will be presented by Mr. W. T. Keating, M. W. S. E., on "Coefficients in Hydraulic Formulae Determined by Measurements of Flow in the Desplaines River Division Made by the Sanitary District of Chicago."

The topical discussion on "Hydraulic Cements and Concrete" will be continued.

The attention of members is called to the fact that the rooms and library of the society will hereafter be open from 8:30 a. m. until 9 p. m., except on Saturday, when they are closed at 3 p. m.

TECHNICAL MEETINGS.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p. m., at the House of the Society, 127 East Twenty-third street, New York City.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E. M., Albuquerque, N. M.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each month, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Tuesday in each month, at 8 p. m., at 12 West Thirty-first street, New York City.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

The Railway Signaling Club holds its meetings in Chicago, Ill., on the second Tuesday of January, March, May, September and November. G. M. Basford, secretary, 818 The Rookery.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. Hadley, secretary, Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Foundrymen's Association holds its meeting on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnston 1522 Monadnock building.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Technical Society of the Pacific Coast has a monthly meeting on the first Friday in each month at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Association of Engineers of Virginia, holds its informal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The American Society of Irrigation Engineers. Third annual meeting will be held at Albuquerque, N. M., September 16-19. John L. Titcomb, secretary, 36 Jacobson block, Denver, Col.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Engineers' and Architects' Club of Louisville has a monthly meeting on the second Thursday in each month, at 8 p. m., at the Norton building, Fourth avenue and Jefferson street, Louisville, Ky.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumberland Publishing House, Nashville, Tenn.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at the Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

The Engineers' Club of St. Louis meets on the first and third Wednesdays of each month, at the Missouri Historical Society building, Sixteenth street and Lucas place, St. Louis, Mo.

The Engineers' Society of Western Pennsylvania holds its monthly meeting on the third Tuesday of each month at 7:30 p. m. at the Carnegie Library Building, Allegheny Pa.

PERSONAL.

The Lidgerwood Manufacturing Co. has appointed Mr. M. A. Green of Altoona, Pa., to the position of sales agent.

Mr. W. W. Peabody, Jr., assistant to the vice president of the Baltimore & Ohio Southwestern will, on April 1, become coal traffic manager of that line.

Mr. D. W. Bigony has been appointed auditor of disbursements of the Erie Railroad Co., vice N. S. Rutter, resigned. Mr. Bigony's promotion is upon the basis of proved ability.

Mr. J. T. Crutchfield is appointed eastern freight agent of the Louisville & Nashville, with headquarters at 353 Broadway, New York City, vice Mr. H. L. Simmons, resigned.

Mr. W. H. Courtney has resigned as roadmaster of the Coldwater division, Lake Shore & Michigan Southern Railway to accept a position with the Keokuk & Western Railroad.

Mr. G. F. Huggins, who was last November made general superintendent of the Choctaw, Oklahoma & Gulf Railway, has resigned that position and the office will be abolished.

Mr. J. R. Coulston has been appointed roadmaster of the Ft. Wayne division, Lake Shore & Michigan Southern Ry., with headquarters at Jackson, Mich., vice Mr. C. B. Hoyt, transferred.

Mr. E. R. Reets has been appointed assistant to General Superintendent Wilbur of the Lehigh Valley. Mr. Reets was formerly assistant to the superintendent of motive power.

Mr. W. W. Young has been appointed eastern agent of the Union Switch & Signal Co., office 1301 Havemeyer Building, New York city, as successor to Mr. John T. Cade, resigned.

An official circular announces the resignation of George B. Hazlehurst, general superintendent of motive power, of the Baltimore & Ohio. He will be succeeded by Mr. Harvey Middleton.

Mr. M. E. Vaillant, formerly American Express agent at Pittsburgh, has been appointed agent of the same express at Quebec. Mr. Vaillant is a brother of the late Mr. George H. Vaillant.

Mr. W. C. Lewis, traveling freight agent of the Empire Lines with headquarters at Toledo, has been appointed to the same position with the Blue Line with headquarters at Detroit.

Mr. A. S. Weisiger, formerly traveling freight agent of the Norfolk & Western, has been appointed general freight and passenger agent of the Chesapeake & Western, with headquarters at Harrisonburg, Va.

Mr. C. B. Hoyt, roadmaster on the Fort Wayne division of the Lake Shore & Michigan Southern Railway has been transferred to the Coldwater division with headquarters at Adrian, Mich., vice W. H. Courtney, resigned.

Mr. W. V. Newlin, formerly general freight agent of the Fort Worth & Denver, but more lately general manager of the California Fruit Express, has been appointed general traffic agent of the Texas Cattle Raisers' Association.

The official announcement is made of the appointment of Mr. J. P. Bowling as traveling freight agent of the Louisville & Nashville with headquarters, Room 503, Lewis block, Pittsburg, Pa., vice Mr. J. T. Crutchfield, transferred.

Mr. J. A. Werne has been appointed contracting freight agent of the Kanawha Dispatch, operating over the the Chesapeake & Ohio road. He takes the place of Capt. J. W. Wheeler, resigned, and will assume his new duties April 1.

Mr. Albert H. Yancy, traveling passenger agent of the Chicago, Burlington & Northern, and formerly connected with the Cincinnati Southern Railroad, died at St. Paul, Minn., on the morning of the 20th after a long and painful illness.

Mr. Chas. M. Hays, general manager of the Grand Trunk Railway and Mr. E. C. Smith, president of the Central Vermont, have been appointed receivers of the Central Vermont road as a result of a suit in equity brought by the Grand Trunk road.

Mr. Joseph B. Stewart has been appointed superintendent of the Hudson river division of the West Shore Railroad, superintendent of the Wallkill Valley Railroad and superintendent of the New Jersey Junction Railroad to succeed Mr. William G. Wattson, recently deceased.

Mr. J. M. Braley, one of the engineers of the Wrought Iron Bridge Company which built the railroad bridge at

Bedford that collapsed a few weeks ago and killed two workmen, was last week acquitted of the charge of manslaughter brought against him at the instigation of the coroner.

At the annual meeting of the stockholders of the Columbus, Hocking Valley & Toledo Railway held in its general offices, Columbus, O., March 19, Mr. W. H. Mills, formerly assistant to president, was elected as director and general manager; the office of president made vacant by the death of Mr. C. C. Waite was not filled.

Mr. Patrick Ward died at Huntington, Ind., on Monday last. He was a veteran in service on the Wabash, and after having been a division roadmaster for many years was promoted to general roadmaster of the Eastern division. Three years ago he was stricken with paralysis, which eventually caused his death.

Mr. George A. Nettleton has been appointed chief engineer of the Ann Arbor, and he will also have charge of the maintenance of way and building department. Mr. Nettleton who comes to the road highly recommended, will begin immediately to lay tracks on the company's extension into its new depot.

The board of control of the Joint Traffic Association, consisting of the presidents of various lines of railroads, held a meeting in New York this week, at which Mr. Edward F. Leonard, president of the Toledo, Peoria & Western Railroad, was elected as arbitrator to succeed ex-Judge J. D. Cox, of Cincinnati, who recently resigned. Commissioner Blanchard submitted to the board a report of the board of managers and an exhibit of the general state of affairs at the present time.

Chas. J. Haigh, the new freight claim agent of the Grand Trunk Railroad went to Montreal on March 23, to assume the duties of his office. At the same time, Mr. Edward Wiles who has been agent of the Commercial Express Fast Freight Line at Detroit, assumed the duties of manager of the same with headquarters at Buffalo, succeeding Mr. Haigh. Both are considered able officials.

Mr. H. O. Wasson has been appointed general agent at Toledo for the Hocking Valley, to succeed the late C. C. Gridley. Mr. Wasson has been connected with the company for a number of years as traveling freight agent. This change brings about a rearrangement of the force, all of which is effective April 1. The following notices are out: Mr. C. F. Mayer is hereby appointed assistant general freight agent, headquarters Columbus, O.; Mr. H. E. Thatcher is appointed traveling freight agent, vice H. O. Wasson, transferred.

General Manager Spoor of the Wagner Palace Car Co. announces the following changes: Superintendent Johnson transferred from the Michigan Central to the Lake Shore station in Chicago; he will be succeeded by District Superintendent Chambers at Detroit. Charles C. Cox, assistant district superintendent at Buffalo promoted to the district superintendency at Detroit; Edward G. Kirk promoted to the position of assistant district superintendent at Buffalo; M. C. Carey, agent, appointed district superintendent at Montreal.

The Mexican Financier says: The present acting general passenger agent of the Duluth, South Shore & Atlantic Railway, Mr. Geo. W. Hibberd, who at present resides at Marquette, Mich., has been offered an important position on the Inter-oceanic Railway under the new regime of General Manager Kline. Mr. Hibberd is well known here. He was formerly assistant general freight and passenger agent of the Mexican Central Railway Company, and later commercial agent in Laredo for the National Railway.

At the meeting of the American Association of Passenger and Ticket Agents held in Richmond, Va., on March 17, the following officers were elected: Dana J. Flanders, of the Boston & Maine Railroad, president; W. A. Turk, of the Southern road, vice president; A. J. Smith, of the Lake Shore & Michigan Southern Railroad, secretary, (re-elected.) A committee on reorganization was appointed, consisting of Messrs. Martin, of the Big Four; Daniels, New York Central; Ford, Pennsylvania; Turk, Southern, and Stone, Eastern Illinois.

It is announced that Mr. D. E. McMillan, of Chicago, has been appointed general freight agent of the Columbus, Sandusky & Hocking road, the appointment to be effective April 1, or soon thereafter. Mr. McMillan, who is 35 years of age, has for the last eight years occupied the position of chief clerk to the general freight agent of the Chicago & Grand Trunk Railway, which he has represented in the late Central Traffic Association meetings. Since the resignation of General Freight Agent Daniel several weeks ago the position has been temporarily filled by General Passenger Agent Akin. There have been a great many applications for the place. Mr. McMillan has the reputation of being a thoroughgoing, hardworking traffic man.

Mr. Harvey Middleton, who recently resigned as superintendent of construction of the Pullman's Palace Car Co., has been appointed general superintendent of motive power of the Baltimore & Ohio system, vice Mr. Geo. B. Hazlehurst, resigned. Mr. Middleton was born in Philadelphia, Pa., in 1852, entering railway service in 1876 as machinist and fireman for the Philadelphia & Erie, being made assistant master mechanic for the same road at the Renovo shops in 1878. In 1880 he was made master mechanic of the first division of the Louisville & Nashville, going to the St. Paul, Minneapolis & Manitoba to fill the same position in 1882. He remained in this position two years, when he returned to the Louisville & Nashville as superintendent of machinery, with headquarters at Louisville. For one year—1889 to 1890—he was superintendent of machinery for the Atchison, Topeka & Santa Fe at Topeka, at which time he became superintendent of motive power and machinery of the Union Pacific, with headquarters at Omaha, Neb. In April, 1891, he entered the service of the Pullman Company, where he remained until his recent resignation.

An accident which resulted in the death of Mr. William A. Allen, chief engineer of the Maine Central road, occurred at Lewiston, Me., on the afternoon of March 21. Mr. Allen was on a train coming into Lewiston for the purpose of inspecting some bridge work being done at that place, and just before the train reached Lewiston he

stepped out upon the platform to see what was being done. He leaned out from the lower step of the platform, it is now believed, and looked over. Just what happened it is difficult to tell, but one of the workmen saw Mr. Allen's head strike one of the posts. He staggered, lost his hold upon the guard and his foothold upon the moving train, pitched forward, struck the girders of the bridge, and bounding with the fearful blow, went over the bridge into the flood that sweeps on below the falls. It was a fearful plunge. No man could live in a fall from this height, for it is fully 60 feet above the falls. Chief Engineer Allen was one of the best known and most highly esteemed officials of the Maine Central. He was 44 years old, a son of Rev. Charles F. Allen, D.D., the well known Methodist divine, and a nephew of the famous "Camp Meeting John" Allen. He was a graduate at the Maine State College, and had been with the Maine Central for over 20 years. He lived at Portland, and was a widower. He was greatly valued by the officials for his ability and prudence. A crew has been searching since the accident for the body, but the river is still at a freshet pitch, and, if ever found, it will probably not be for days, and then miles below the city.

Mr. George H. Nettleton president and general manager of the Kansas City, Fort Scott & Memphis Railroad died at his home in Kansas City on the evening of March 26, aged 65. Death resulted from paralysis, and for several weeks his life has been despaired of. Mr. Nettleton was an eastern man having been born at Chicopee Falls, Mass., entering railway service in the construction department of the New Haven & New London road in 1851. In 1853 he became assistant engineer of the Terre Haute & Alton, and in 1854 resident engineer of the Great Western of Illinois. From 1854 to 1856 he was with the surveying corps of the Alton & Jacksonville (now Chicago & Alton) and from 1857 to 1860 he was resident engineer of the Hannibal & St. Joseph, after which he held the positions of auditor and purchasing agent, chief engineer and assistant superintendent and general superintendent of the same road. In July, 1872 he became general superintendent of the Atchison, Topeka & Santa Fe. During the time from 1874 to 1888 he was connected with a number of western roads being general manager of the Atchison & Nebraska, Kansas City, St. Joseph & Council Bluffs, Kansas City Lawrence & Southern Kansas, and Kansas Fort Scott & Gulf; president of the Kansas City, Springfield & Memphis, Kansas City Clinton & Springfield, Kansas City Memphis & Birmingham, and in 1888 was made president and general manager of the Kansas City, Ft. Scott & Memphis, and also the Current River road, which positions he still held at the time of his death.

RAILWAY NEWS.

Boston & Maine.—It is said that no property owned by Boston & Maine R. brings it in a better income in proportion to its size than the wharf privilege at Bar Harbor, where all the steamboats land. This wharf property is to undergo extensive improvements, which will be done in season for the business of 1897. During last summer about 50,000 people arrived and departed at the wharf. The plans as drawn call for an entire set of new buildings and also show that on the front of the wharf there will be an extra slip built for boats. The slip where the Frank Jones lands will be built nearer the Mount Desert end of the wharf. In the center will be built an extra slip. The Maine Central waiting room and ticket office is planned to be at the right of the present slip where the Sebeoia ties up, and on the front of the wharf proper. Immediately in the rear of the waiting room and ticket office will be a store room and parcel room. Across the way from the ticket office will be a commodious freight building. Another slip will run alongside this building, and at the farther end of the wharf will be the freight house and ticket office of the Bar Harbor & Bangor steamboats. The American Express Co. will also have an office and freight rooms there. All of these buildings will be under one roof, which will be metal covered.

Carolina, Knoxville & Western.—An order has been signed by Judge Simonton of the United States circuit court for the sale of the Carolina, Knoxville & Western Railroad, the sale to be made at Greenville on April 18, next, the same order appointing Mr. W. C. Beattie special master to make the sale. No bid will be received for less than \$30,000, and the successful bidder must deposit with the special master a certified check for \$5,000. This will make the second attempt within a month to sell this road, the former attempt having resulted in no sale. It is understood, however, that the reason no sale was effected at the former attempt was because of a misunderstanding concerning the condition of the road, which has since been cleared up. It was reported last week that the Port Royal & Western Carolina Railroad people have decided to purchase the property, and that even if they do not purchase there will be other bidders and a sale effected.

Central Vermont.—Receivers have been appointed for the Central Vermont R. on account of a suit in equity brought by the Grand Trunk R., which seeks to obtain the sum of \$415,712.45, alleged to be due on traffic charges. This action was taken last week, and applications have been filed in Boston and New York. Col. Edward C. Smith, the president of the road, and Charles M. Hays, general manager of the Grand Trunk R., are to be receivers. The present Central Vermont corporation was organized Dec. 9, 1891, for the consolidation of the Central Vermont, Vermont & Canada, Consolidated of Vermont & Montpelier and White River Rrs. It now operates 802 miles of track, most of them leased, these latter including nearly a dozen small lines. The action in this case grows out of the filing of a complaint in the United States circuit court of the district of Vermont, in which the plaintiff seeks a foreclosure of an equitable lien upon the gross earnings of the defendant company. It is claimed that since 1884 the defendant corporation assumed control by lease from the Consolidated Railroad Co. of Vermont and other corporations of the Vermont & Canada and a number of other railroads composing the Vermont Central system, and that it now has about \$22,500,000 worth of bonds outstanding upon which no interest has been paid. The balance due plaintiff on March 1, 1896, under its particular lien, is alleged to be \$415,712. In its answer the defendant company

admits the validity of the lien, but asks that the plaintiff be required to furnish proof as to amounts due. President E. C. Smith has made a statement which contains the following: "The receivers were appointed upon the petition of the Grand Trunk R. Co. to the United States circuit court for the district of Vermont. That company is a large holder of the securities of the Central Vermont Co., and also a creditor. The application was made entirely without the knowledge of the Central Vermont, and was a complete surprise to its officers. The motive of the Grand Trunk Co. in this move is not entirely well defined, but from the fact that Mr. E. C. Smith, president of the Central Vermont, was at its request associated with Mr. Charles M. Hays, general manager of the Grand Trunk Co., on the receivership, it may be safely assumed that it had only the best interests of the property in view, and that there will be no interruption in the operation of the property so far as concerns the personnel of the staff, or in its arrangements with its railroad connections, or in the friendly relations between the Central Vermont and Grand Trunk companies. The floating indebtedness consists of bills payable and notes. The latter are largely secured by collateral, and the former mostly protected by the order of the court, which provides for the payment of all outstanding indebtedness for labor and supplies accrued within the past six months." It is understood that the receivership does not affect the Rutland road, commonly known as the Rutland division of the Central Vermont, but the receivers may continue trains over it, provided they first get the consent of the Rutland Railroad Co., as provided in the lease. The gross receipts of the Rutland road, as they accrue from day to day at the different stations on the line, are paid to a trustee and do not go into the Central Vermont treasury, nor are they under its control. At the end of each month after paying to the Rutland road its rental due, the trustee pays the balance to the Central Vermont, so that there is at all times a large amount of money due the Central Vermont from this source. The rental amounts to \$370,000 a year, and the gross receipts of the road are from \$800,000 to \$1,000,000 a year.

Chicago & Alton.—On Monday last, two new short lines for through freight were opened by the Chicago & Alton. For a number of years past it has been said that the Alton was anxious to secure a direct outlet from Chicago to and through Peoria. It required the construction of only 12 miles of road to give it a line of its own from Chicago to Peoria, but to secure an outlet from Peoria to a connection with its own road at Delavan and get from Peoria to St. Louis and Kansas City would have required the construction of over 30 miles of new road. The company felt reluctant to build the new extensions, and consequently arrangements have been made with the Toledo, Peoria & Western to let it run over its tracks from Washington to Peoria and with the Peoria, Decatur & Evansville to give it the required outlet from Peoria to Delavan and Lincoln on its Kansas City and St. Louis lines.

Choctaw, Oklahoma & Gulf.—It is reported that on March 20 the Choctaw, Oklahoma & Gulf R. Co. completed the formulation of a plan for the issue of 80,000 shares of preferred stock to enable the company to provide for the extinguishment of its car trusts and extension of its lines. The plan proposes to reduce its obligatory charges from \$325,000 to \$210,000. The par value of the new stock is to be \$50 a share, entitled to dividends up to the amount of 5 per cent per annum in advance of dividends on the company's common stock. It is understood that a large portion of the new issue has already been underwritten and followed 75 per cent of the general mortgage bonds assented to. The lowering securities will be taken by the company in payment for the stock: General mortgage bonds, \$1,200,000; income mortgage bonds, \$1,110,000; cash, \$650,000; total, \$2,950,000. By this arrangement the company is enabled to retire \$2,000,000 of existing obligations, build the connection with the Kansas City, Pittsburg & Gulf R., a distance of about 12 miles, and secure \$192,000 cash for present use, besides leaving \$1,500,000 general mortgage bonds in its treasury.

Detroit, Lansing & Northern.—An official circular has been issued at Boston under date of March 20, which reads as follows: Detroit, Lansing & Northern R. R. Co., 7 per cent bonds; Grand Rapids, Lansing & Detroit R. R. Co., 5 per cent bonds; Saginaw & Western R. R. Co., 6 per cent bonds; Saginaw Valley & St. Louis R. R. Co., 8 per cent bonds; Ionia & Lansing R. R. Co., 5 per cent bond coupons overdue; Detroit, Lansing & Northern R. R. Co., preferred stock. Pursuant to the reorganization agreement of Feb. 1, 1896, holders of more than 80 per cent of securities have signed the agreement and deposited their securities. The holders of all outstanding securities who fail to sign the agreement and deposit their securities or receipts representing them under the former plan, on or before April 15, 1896, will be excluded from the benefits of the agreement, except upon such conditions or penalties as the committee may deem just. The depositaries under the agreement are Charles Merriam, treasurer, 50 State street, Boston, and the Guaranty Trust Co., 65 Cedar street, New York, from whom copies of the agreement may be obtained. Reorganization committee—H. Hollis Hunnewell, Nathaniel Thayer, Alpheus H. Hardy, Mark T. Cox and James Timpson.

Gulf & Ship Island.—It is said very few people have believed that there was any immediate prospect of the Gulf & Ship Island road ever becoming a line of any significance either to Mississippi or any other state. This, however, according to reports from that territory, is a mistake, as work is rapidly progressing and it is hoped to have the line completed by the first of another year. The grading between Hattiesburg and Gulfport was largely done some ten years ago after which the road went into the hands of the receivers, and for some ten or twelve years has been doing nothing. The affairs of the road have now been arranged in some better shape and work is progressing in first class style. Men are at work at both ends of the road, and in the middle is a force of bridge people at work getting bridges built. The road has been all regraded and the track laid for 20 miles north from Gulfport and from Hattiesburg south for some three or four miles, the whole distance between these two points being 72 miles. The original intention of the promoters of the Gulf & Ship Island road was to run the line into Jackson, Miss., and from thence to Memphis. These plans, however, have been changed in some respects, and the road for some time yet will have Hattiesburg as its

northern terminal. The terminal at Gulfport is to be started soon. In securing deep water there it has been found necessary to build the road some four or five miles out into the sound. The work will be started at once. Some weeks ago the state of Mississippi sent a special commission to Gulfport from the legislature for the purpose of looking at the place and seeing as to the chances of deep water. This committee made a very favorable report and the engineers of the road say that by building out some four or five miles into the sound towards Ship Island that a depth of 25 ft. can be secured. It may be necessary to dredge some in order to get this depth. It is expected that the Gulf & Ship Island road will open to commerce a very fertile tract of Mississippi. This is a section of the southern part of the state, which is entirely covered with a heavy growth of pine timber, the finest in the country. Besides this the country is very fertile, possessing fine soil and plenty of water.

Illinois Central.—During the present year it is said that the Illinois Central R. Co. will spend \$1,250,000 for double tracking its line the entire distance between Chicago and Cairo, and in order to accommodate the increased movement of trains, it also contemplates placing about 60 miles of passing tracks on the lines south of the Ohio river.

Louisville, St. Louis & Texas.—A decree was entered in the United States court at Louisville on March 23 ordering the sale of the Louisville, St. Louis & Texas R. within 60 days. The order was entered on the complaint of the Central Trust Co. of New York, trustee of \$3,357,666.67 of first and second mortgage bonds. George Weissinger Smith of Louisville was appointed master commissioner to conduct the sale within the next 60 days and to pay to the creditors the amount due. Col. Atilla Cox, the present receiver, is to be president of the company after the reorganization, toward which this is a step, all arrangements having been made for the purchase of the road by the bondholders. During the receivership the property has been greatly improved and the operating expenses materially reduced. It is the hope of the new company to make a strong alliance with the Louisville & Nashville at Henderson for a through line to St. Louis for both passenger and freight business. It has always had a freight alliance, but it is the desire to put on a double daily passenger service to St. Louis.

Macon, Dublin & Savannah.—The Illinois & Georgia Improvement Co., which was organized to construct a road from Macon to Savannah, Ga., has finished and is operating some 54 miles. It expects soon to complete the balance of the work and will have the short line from Macon to the seaboard, transecting a large body of pine timber, which will give the line a large traffic for years. At the recent annual meeting of the company, the following officers were elected: President, Joy Morton; vice president, Jas. T. Wright; secretary and treasurer, Alex. C. Soper, with the following directors: E. P. Ripley, W. A. Fuller, Joy Morton, B. M. Frees, Jas. T. Wright, J. P. Underwood and Alex. C. Soper.

NEW ROADS AND PROJECTS.

Arizona.—Phoenix dispatches state that incorporation papers of the Saluda Southern R. have been filed, in which mention is made of 878 miles of railway projected to center in Phoenix and to run to Flagstaff, Yuma and Nogales, as well as embracing several lines tapping the agricultural lands of the northern portion of Salt River valley. The capitalization is for nearly \$20,000,000, and the incorporators are nearly all local, but Langdon, Linton & Co., of Minneapolis, are said to be behind the scheme.

Arkansas.—The Fort Smith & Western R. Co. which is to build a road south from Ft. Smith to McAlester, I. T., has established an office at Ft. Smith and subscription books are soon to be opened. It is said that negotiations are about completed for the sale of a million and a quarter of bonds and a contract has been let for building five miles of the road. The road will be an important one for Fort Smith as it will open a large tributary country, and also coal fields. The road will be 81 miles long crossing both the Frisco and Kansas City, Pittsburg & Gulf Rys., and connecting with the Missouri, Kansas & Texas road. The company building the road holds long leases of coal lands in the Indian Territory, said to be far richer than those along the Choctaw road. Although built principally for a coal road, it crosses a fertile country, and will doubtless prove valuable as a feeder to the roads which it intersects. Mr. E. J. Crandall, president of the new line, has lately been in Washington, D. C., looking after a bill giving the necessary right of way.

California.—Articles of incorporation of the Vallejo Ferry Co. were filed with the county clerk at Suisun last week. The objects of this company are to conduct freight and passenger business, to purchase or build boats, slips or wharves, and to acquire privileges and franchises for conducting the ferry line. The principal place of business will be Vallejo. The term of its existence will be 50 years, and the amount of its capital stock will be \$60,000, divided into 600 shares of the par value of \$100 each. Among the directors are some of the most prominent men of Vallejo.

Florida.—The new Florida road which is to be built from the bay of Biscayne to Key West, reference to which has already been made in this column, will be a novelty in railroads. It is proposed to run the line 160 miles along the partly submerged coral reefs and low-lying islands of the west coast of Florida. The channels between the keys, which are to be bridged, vary in width from an eighth of a mile to five miles, the widest being at Bayou Hundia. In these channels the water is only three to four feet deep and this shallowness simplifies the problem of engineering. The islands are flat and offer every advantage for cheap and easy railroad building. There is a commercial interest in the building of this road in that it will bring Havana a day nearer New York.

Kentucky.—Report says that a corps of surveyors will soon commence running a line through Kentucky, from the Jellico coal section, by way of Cumberland Falls, to Carrollton, Ky., opposite the Indiana shore, on the Ohio river. This will form a part of the new Black Diamond Railroad, which is a projected short route from Chicago to the seaboard at Savannah, Ga. The route planned through Ken-

tucky pierces the richest mineral and blue grass sections and taps the immense water power possibilities at Cumberland Falls. Colonel Albert Boone, of Knoxville, is president of the new enterprise.

Mexico.—The offices of the president and executive officers of the International Pacific Railway, which has recently been incorporated, will be in Chicago: law department and general offices in United States at Kansas City, Kansas, while the general offices in Mexico will be at Guaymas. The preliminary survey of the line has been made from Guaymas to Tonichi, 115 miles, and this portion of the line will be put under construction at once, the company owning an extensive tract of land containing an immense deposit of coal and other valuable minerals. The International will connect with the Sonora Railway at or near Ortiz and the Sonora line will be its outlet to the states for some time at least, as the building of the line to Deming is a matter for future decision, the intention of the company being to not lay a mile of track that will not be revenue producing, confining its efforts to affording an outlet for the rich mineral regions of eastern Sonora and Western Chihuahua to the port of Guaymas and the Sonora Railway. An extension is contemplated from Tonichi to a connection with the Mexican Central at Santa Rosalia, but this depends entirely upon the engineers, who are now making reconnaissance, being able to find a practicable route through the Sierra Madre range. The officers of the new company already appointed are as follows: Frederic Bartlett, president; H. T. Richards, first vice president and general manager; Chas. N. Hale, second vice president and purchasing agent; David D. Hoag, third vice president; Walter G. Seaver, secretary; Geo. E. Wodehouse, treasurer; Winfield Freeman, general solicitor. The remaining officers are not yet appointed.

Michigan.—It is said that a mass meeting of representative business men and property holders of Houghton county was held at Hancock, March 19, to consider means to secure a competitive railroad into the Lake Superior copper country. A delegation consisting of Jay Hubbell and Messrs. Duncan, Wright, Wilson and Cuddihy were appointed to go to Chicago to confer with railroad companies in the matter of extending their lines into the copper district. Resolutions were adopted showing the wealth and population of the district, and inviting the Chicago, Milwaukee & St. Paul, and, in event of its refusal, the Chicago & Northwestern to extend its lines.

It is said that at a meeting held at the Great Northern Hotel in Chicago on March 24, an agreement was reached by the property owners of Benton Harbor, Mich., and representatives of the Vandallia Line, whereby the property owners have given the road right of way across a big swamp between Benton Harbor and St. Joseph. The towns are only one-third of a mile apart, but by the Vandallia Line, which at present makes a detour to avoid the swamp, the distance is nearly two miles. The new right of way is practically an air line. It passes a tract of land on which Benton Harbor parties will erect a tack factory to cost \$35,000, and where other manufacturing enterprises will be established.

Missouri.—The St. Louis, Mansfield & Ava Southern R. Co., the organization of which was noted last week, on March 20 filed articles of incorporation with the secretary of state at Jefferson City, Mo., and a charter has been granted. The road, which will be 69 miles in length, is to be operated between Lebanon, Leclade county, and Ava, Douglas county. Capital stock, \$1,200,000.

New York.—Authority has been given the Albany, Helderberg & Schoharie Electric R. Co. by the state railroad commission to build its road from Albany to Schoharie Court House, a distance of about 30 miles. The road, if constructed, will run through the most thickly populated districts of Albany and Schoharie counties, taking in several large villages having manufacturing and milling industries, and touching districts adjacent which are rich in lime, flagging, building and curbing stone quarries, and farming and dairy products. Nearly all of this territory is far removed from any railroad.

North Carolina.—It is said that official announcement has been made of the purpose to build an extension to the Suffolk & Carolina road, which at present runs from Suffolk, Va., to Montrose, N.C., from the terminus at Edenton, an important shipping town in eastern North Carolina, a distance of about 15 miles. By this extension it is thought that not only Edenton, but other important towns adjacent will be put in direct connection with the Norfolk & Western and the Seaboard Air Line systems at Suffolk, and the Suffolk & Carolina will serve as a feeder to those two large systems, opening up a rich country which furnishes heavy shipments of truck and lumber, etc., none of which these systems are receiving from that territory at present.

An extension of the Roanoke & Southern is being considered, to extend from Winston to Charlotte, N.C., a distance of about 100 miles. This extension would really be a most important piece of railroad building, opening up, as it would, an entirely new through trunk line by the connections and alliances it is proposed to make and bring about.

It is also reported that President Hoffman and Vice President St. John have been looking over the ground with a view to extending the Seaboard Air Line into Asheville, a plan they have long been nursing and hoping to develop into a reality. It is said it now looks as though this is about to be accomplished by the building of a road from Rutherfordton, N.C., to Asheville, a distance of 42 to 45 miles, according to route taken.

Ohio.—The engineering corps is making a final survey for the purpose of locating the new Toledo extension of the Flint & Pere Marquette R., and it is said that graders will begin work as soon as the frost is out of the ground. The entrance of the F. & P. M. is considered an important railway event by the citizens of Toledo, and it is hoped to be running trains into that city by fall of this year.

Pennsylvania.—The Georgetown branch of the Pennsylvania, which is 2¾ miles in length, was formally opened on March 23. The road is a new branch and was built to accommodate the company's business in and around Washington. It commences at the south end of the Long Bridge at Washington and runs to Georgetown, on the Virginia

side of the Potomac, where it connects with the Washington Southern.

Washington.—On March 13, at Tacoma, Wash., the Puget Sound, Mt. Tacoma & Eastern R. Co. was incorporated with a capital stock of \$2,000,000, principally subscribed by eastern capitalists. For the first ten miles in the direction of Mount Tacoma, which is the first objective point on the new line, and 40 miles distant from the city of Tacoma, it is proposed to follow what is known as Hart's Logging R. From Mount Tacoma the road will build eastward and will probably connect with the Chicago, Burlington & Quincy.

Wisconsin.—The Chicago & Northwestern R. Co. has let 60 miles of the grading and bridging of the Wisconsin Northern R. to D. D. Streeter, contract to be completed by October 1. The line to be built is to run from Gillett, Oconto county, Wis., on the Oconto branch, north 85 miles to Stager or Iron river, Mich., on the line to Ashland, and the contract already let is from Gillett to a point near Cavour. This extension passes through the land grant of the company. It is said that the company is also contemplating another extension from Galesville, Wis., northeast to Merrilan, about 40 miles. There is already a spur from Trempeleu northeast to Galesville.

INDUSTRIAL NOTES.

Cars and Locomotives.

—The Missouri Car & Foundry Co. has the contract to build 500 box cars for the Chicago, Paducah & Memphis Railroad, and the St. Charles Car Co. has a contract for 500 cars for the same road. The cars are for an equipment trust and are to be built on the car builders' own specifications.

—The Jackson & Sharpe order for 13 vestibule coaches for the Central Vermont Railway is to be equipped with the New York Air Brake Co.'s complete equipment.

—The third 96 ton electric locomotive for service on the main line of the Baltimore & Ohio Railroad is almost ready for the test at the shop of the General Electric Co., at Schenectady. The first of these machines was put into service last July, and the second five months later. Since that time they have been working continuously without accident, hauling the entire freight service of the Baltimore & Ohio line out of and into Baltimore from the north.

—The Texas & Pacific is taking bids on 300 box cars.

—The Seaboard Air Line will build 300 box cars immediately. Half of these cars will be built at the company's shops at Portsmouth, Va., and the remaining 150 will be contracted for with outside shops. It is reported that later on in the year a further order for perhaps 1,000 cars will be given out by the company. It will also purchase 15 new freight locomotives for the divisions in Virginia and the Carolinas. Specifications have been prepared, but no contracts have yet been made.

—The Louisville, New Albany & Chicago Railway has commenced the equipping of their old cars, at the rate of 100 sets per month, with the New York air brake and M. C. B. coupler.

—Poulterer & Co. of Philadelphia, has purchased the old Gaylord rolling mill, at Portsmouth, Ohio, and the Wampum (Pr.) furnace. They will dismantle both shops. The firm has just sold a locomotive to the Wilcox Lumber Co. of Seville, Ga., and one to the Suffolk & Carolina, of Suffolk, Va.

—The receivers of the Baltimore & Ohio Railroad Co. (John K. Cowen and Oscar G. Murray) have put in full operation its Mt. Clare shops, increasing the force to 1,150 men.

—The Greenville, Nashville & Chattanooga Railroad will soon buy equipment for 20 miles of road, including rails, cars, locomotives, etc. George H. Bunch, Memphis, Tenn., is purchasing agent.

—The Pennsylvania road is building a number of new postal cars at its Meadow shops. Two such cars have just been completed for the Pittsburgh, Cincinnati, Chicago & St. Louis. Besides the work on these new cars these shops are making general repairs on a number of the old postal cars.

□—The Haskell & Baker Car Co. is building 250 cars for the Louisville, New Albany & Chicago. These cars are to be equipped with the American continuous draw bar New York air brake and Chicago coupler.

—The plant at St. Joseph, Mo., originally built for the manufacture of cut nails, is being remodeled by the St. Joseph Bar & Axle Co. This company proposes to make merchant bar iron, car axles, links and pins. The works are expected to be in operation by the middle of April. G. T. Walker will manage the plant.

■—The Jackson & Woodin Manufacturing Co., Berwick, Pa., has received the order for building the entire 1,000 coal cars the Delaware, Lackawanna & Western.

—The New Orleans & Northeastern Railroad Co. has just placed an order for new compound engines with the Richmond Locomotive Works of Richmond, Va.

—The Madison Car Works has orders in hand for 1650 cars to be built within the next three months. The remaining 200 of the Wheeling & Lake Erie were awarded to them—making 500 in all.

—The Plant system of railways has equipped an air brake instruction car with the New York Air Brake Company's equipment. It is pronounced one of the first equipped air brake cars in the south. This system are attaching the New York brake apparatus to all cars and engines on its roads.

—J. R. Beaty & Co., Quinimont, W. Va., is in the market for 15 miles of rails and rolling stock.

—The Philadelphia & Reading Railroad has ordered from the Union Car Co., of Depew, N. Y., twenty-five improved Wickes patent refrigerator and ventilated cars.

—The Pullman Co. is to build six passenger coaches for the Grand Rapids & Indiana Railroad, to run in the Cincinnati night service of the road. They are to be fitted

with vestibules, Janney platform and coupler, and Fuller wheels. Three of them will be combination coaches.

—Specifications are being prepared for 4,000 new freight cars and 75 new locomotives for the Baltimore & Ohio Railroad. These specifications will be completed next week and bids will then be invited. It is roughly estimated the order will involve an expenditure of about \$3,000,000. The decision to secure the equipment is in line with the policy begun by Receivers Cowen and Murphy soon after they took possession of the road.

—It is stated that Shickle, Harrison & Howard, the Syracuse Malleable Iron Co., and the Springfield Malleable Iron Co., have retired from the coupler business.

—The Schoen Pressed Steel Co., capitalized at \$1,000,000, has purchased the plant of the Schoen Manufacturing Co. for the manufacture of truck frames, and in addition purchased 5 acres of ground adjoining present plant. The plant now has a capacity of 125 truck frames per day, but with improvements to be made this will be increased to 300 per day. In addition to the pressed steel truck frame invented by Mr. Charles T. Schoen, and illustrated in the RAILWAY REVIEW of March 7 (page 131) the company will manufacture all of the pressed steel specialties heretofore made by the former company, and now so universally in use by the railroads of this country. It said that New York, Philadelphia, Pittsburgh and Chicago parties are interested in the new company.

Buildings.

—Plans for the for the plant of the Hassell Iron Works of Colorado Springs, Col., are completed and work will be commenced at once. The foundry will be of brick, 52x60 ft., and will be equipped with the best modern machinery.

—The Penn Steel Casting Co. of Chester, Pa., will erect an addition to its plant, which will double the capacity of the molding room. The new building will be 120x105 ft., and will have a new electric crane and a high speed auxiliary crane. A new foundry is being built, and when completed the chipping room will probably be extended to the machine shop.

—The New York Equipment Co., 80 Broadway, New York city, which is about completing buildings at Dunkirk, Ind., for a locomotive and car repair shop, is in the market for the iron and woodworking machinery and steam outfit necessary for such a plant. This company, which is incorporated under the name of the Dunkirk Locomotive and Car Repairing Co. of Dunkirk, Ind., will need a large amount of machinery in equipping this plant, as it expects to open up the largest and most complete repair shop of its kind in this country. The plant is located in the heart of the natural gas district.

—W. C. Arp, superintendent of motive power of the Vandalia, admits that the statement that the old Terre Haute & Indianapolis shops of the Vandalia at Terre Haute are to be remodeled and enlarged is correct.

—The Ontario Car & Truck Co. recently incorporated at Oswego, N. Y., has purchased a site in that place 125x496 ft. and will erect a large modern plant in the spring. The concern will manufacture cars, trucks, ventilators, heaters, etc.

—The Lloyd Booth Co. of Youngstown, Ohio, will greatly increase the capacity of its machine shops, and will make a number of other improvements.

—The Chattanooga (Tenn.) Foundry & Pipe Co. has completed purchase of a 31 acre site on which it intends to erect a larger and new plant.

—The work on the new Ann Arbor depot at Toledo is progressing rapidly despite the unfavorable weather.

—Specifications are being prepared by the Eagle Iron Co. of Meadville, Pa., for the erection of a new plant at Youngstown.

—The Southern Railway Co. has let the contract to John P. Pettijohn of Lynchburg, Va., for the erection of the buildings for its Salisbury shops, announcement of which has previously been made. The structures will cost \$75,000.

—The Penn Bridge Co. of Beaver Falls, Pa., states that it is running the works full and will soon go on double turn. The company recently completed the buildings for gas producers for Linden Steel Co. and also for Carbons Steel Co., the latter building being 300 ft. long; warehouse for Union Iron & Steel Co., Youngstown, 300x60 ft., also addition to rolling mill building of Pittsburgh Reduction Co.'s works at New Kensington, Pa. The erection of the new building at the lower works of Pittsburgh Reduction Co. at Niagara Falls, will soon be begun, while a large rolling mill building for Messrs. Hubbard & Co., at the site of their works recently burned will be erected shortly. The new works for the Keystone Axle Co. at Morada, Pa., 200x80, are under course of completion. The company has contracts for a number of small bridges in Newton county, Indiana; Lavaca and Harris counties, Texas; and Jefferson county, Wis., a 170 ft. drawbridge with iron substructure across Vermillion river at Abbeville, La. The work is well under way for suspension bridge across the Ohio at Rochester, 2,200 ft. in length, with channel spans of 800 ft. and for a similar bridge at East Liverpool, Ohio, 1,600 ft. in length with channel span of 750 ft. The company recently contracted for steel roof of new water works at Duquesne, Pa.

Bridges.

—The contract for the new Pride's bridge, of Portland, Me., has been awarded to the Boston Bridge Works. The structure is a 141 ft. steel bridge with an 18 ft. roadway. The abutments are to be of granite.

—Proposals are wanted until April 7 for the construction of an iron bridge across the Des Moines river at Emmetsburg, Ia.

—A new iron bridge will take the place of the old wooden structure that has stood for so many years in Topsham, Me., the pier being carried away, it will take some time to get the bridge in position.

—County Engineer Betz has submitted his report on the bridgework recently ordered for Hamilton county, Tenn. For Whiteside street, Chattanooga, a 36 foot roadway bridge is recommended to cost about \$11,612, \$8,000 of which is estimated for steel work and the rest for masonry; the

Lightsfoot Mill bridge to be of steel to cost \$2,360, and the Soddy creek bridge to cost \$1,805.

—Work has begun on the new steel bridge across the Androscoggin at Gilbertville, Me. The builders say that it will be the best on the river. The stone work has been let to Waterville parties for \$10,500.

Machinery and Tools.

—The Carterville (Mo.) Foundry & Machine Co., whose shops were recently destroyed by fire are about to rebuild. The contract for the new equipment of machinery has been awarded to the Davis & Egan Machine Tool Co., of Cincinnati.

—The Cleveland Twist Drill Co., Cleveland, O., is distributing gilt edged, leather bound memorandum books, which are both handsome and useful.

—Watson & Stilman have received an order for the building of 15 draw benches for bicycle tube manufacture, each of them with a stroke of 18 ft.

—The Stilwell-Bierce & Smith-Vaile Co., of Dayton, O., has taken the contract for the complete water power plant to be installed at the Lachine Rapids in the St. Lawrence river. This power is second only to Niagara Falls in importance, and is owned by the Lachine Rapids Hydraulic & Land Co., Ltd., of Montreal, Can. It is located at the famous Lachine Rapids on the St. Lawrence river, so well known to tourists, about five miles above Montreal. The initial development will amount to 10,000 horse power. The work of construction has already begun, and the company expects to be prepared to furnish power before the close of this year. It has contracted with the Stilwell-Bierce & Smith-Vaile Co. for 66 largest size Victor turbines of the latest pattern, and all connecting machinery needed for transmitting the power of these turbines to the electric generators.

—Speidel & Roeper, Reading, Pa., have lately turned out a large number of hand traveling cranes. They have shipped among others, there 5-ton 26 ft. span, cranes to the National Tube Works Co., McKeesport, Pa.; one 6-ton 54 ft. span, to the Chester (Pa.) Electric Light & Power Co.; one 8-ton, 20-ft. span, to the Nekosoa (Wis.) Paper Co.; one 3-ton, 12 ft. span, to the University of Illinois, and one 3-ton, 23 ft. span, to Auld, Conger & Co., of Bangor, Pa. At present they are building to the order of the Niles Tool Works Co. one 20-ton, 50 ft. span crane for the Rockwell Construction Co. of Staten Island, and two 20-ton, 60 ft. span, for the Baltimore & Catonsville Construction Co., of Baltimore. They are working a larger force of men than ever before and report the outlook for their Spiedel hoists and other specialties very encouraging.

—Koehler & Streng have just placed in their scrap yards, on Liberty avenue, a pair of lever shears, 4½ x 4½, weighing 100,000 pounds, which are said to be the largest in this country. These were built by the Frank-Kneeland Machine Company. Other improvements to the yard consists of large rail shear, a railroad track scale and a new side track which when completed will make it one of the best equipped scrap yards in the country.

—It is reported that the Ohio Steel Co., Youngstown, Ohio, has made a reduction of 10 per cent in wages of its employees.

—The interests of H. J. Williams and George Sleeth in the Superior Steel Co., at Carnegie, Pa., manufacturer of cold rolled steel, have been purchased by J. S. Seaman, Jr., of the firm of Seaman, Sleeth & Black, proprietor of Phoenix Roll Works, at Pittsburgh.

—It is announced that arrangements for the amalgamation of the ordnance department of the Cramp's works with other extensive organization have been completed and that hereafter the various gunmaking concerns interested will be known as the American Ordnance Company. The new company embraces the Cramps, or as the plant is known officially, Driggs-Schroder Ordnance Co.; the Hotchkiss Gun Co., of Providence, R. I., and Hartford, Conn., and the American Projectile Co., of Lynn, Mass. The president of the company is General A. C. Ordway, and the general superintendent is E. C. Parkhurst. The capital is \$2,500,000, and the main offices will be at Washington with the works at Bridgeport, Conn.

—The Oliver Iron & Steel Co. of Pittsburgh has made a reduction of 10 per cent in the wages of tonnage men in its employe, which went into effect on Monday, 16th inst. about 50 men are affected by the reduction. It is stated that just as soon as condition of trade warrants, the reduction will be restored.

—The Reading Iron Co. of Reading, Pa., operating the Montour Rolling Mills, has notified its employes of a reduction in wages of 8 1-3 per cent.

Miscellaneous.

—At the annual stockholders' meeting the following of the Union Switch & Signal Co.'s officers were re-elected: President, Geo. Westinghouse, Jr.; vice president, E. H. Goodman; board of directors, George Westinghouse, Jr., A. M. Byers, Thomas Rodd, James H. Willock, Wm. McConway.

—Some idea may be gathered of the extent to which transmission of power by electricity is gaining ground in this country by the statement that in the long distance plants installed by the General Electric Co. during 1895, over 1,200 miles of copper wire for transmission purposes alone were used, amounting practically to 1,200,000 lbs. of copper.

—The McKnight Manufacturing Co. has contracted to furnish Kaolin covering for all the steam pipes, etc., in the plant of the Westinghouse Electric & Manufacturing Co. at East Pittsburgh. The contract calls for about 25,000 square feet.

—All the shops of the entire Union Pacific system were closed on March 20. They are to be closed one day a week for a while. It is stated that the lack of business was alone responsible for the cut. The expense of the mechanical department had of late been out of proportion to the receipts, and the receivers have decided that a policy of retrenchment must be inaugurated in that department as in others. The trainmen, switchmen and other employes whose services are required in the handling of cars, and are necessary to the running of the trains, are all at work, but all others are enjoying a holiday.